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# THE BULLETIN

OF THE

## U. S. Army Medical Department

A periodical containing original articles, reviews, news, and abstracts of interest to the Medical Department of the Army



ISSUED UNDER THE AUSPICES OF  
THE OFFICE OF THE SURGEON GENERAL

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NORMAN T. KIRK,  
Major General, U. S. Army,  
The Surgeon General.

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**APRIL 1945**

**THE BULLETIN**  
**OF THE**  
**U. S. Army Medical Department**

**ISSUED MONTHLY**

**WAR DEPARTMENT**  
**OFFICE OF THE SURGEON GENERAL,**  
**WASHINGTON 25, D. C.**

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### **U. S. Army Medical Department**

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## Foreword

With the October 1943 issue, The Bulletin became a monthly periodical, instead of a quarterly, dedicated to keeping the personnel of the Medical Department informed on developments in war medicine. The new publication, known as The Bulletin of the U. S. Army Medical Department, absorbed the former quarterly dental and veterinary bulletins and will have material devoted to those fields in each issue.

The Bulletin is intended to be educational rather than directive in nature. It will contain the best information obtainable concerning military medical experience, observations, and procedure that may help to improve further the quality of professional services. The Bulletin will be a medium whereby experience gained in one theater of combat may be shared with those serving in other combat areas and with those in this country who are preparing for overseas duty. News items concerning military and scientific developments as well as original articles will be emphasized. The Bulletin, however, should not serve as a basis for the forwarding of requisitions for equipment or supplies referred to therein.

Obviously, some of the most interesting field experiences cannot be divulged in a periodical of this kind when our country is at war. The Bulletin will, however, publish that which can be safely told, drawing not only on current literature, but on many authoritative reports which reach The Surgeon General's Office from the field. Officers are invited to submit for publication reports of their field experiences that can profitably be shared with other officers.

The Medical Department has been commended for its work in caring for the sick and wounded in theaters of operations in war. The Bulletin will endeavor to stimulate such progress and to advance further the high standard of medical service in the Army of the United States.

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An American soldier drying socks and checking his feet for signs of trench foot near fire along roadside in Luxembourg, 26 January 1945. Signal Corps photograph.



On the way to the front in the European Theater of Operations. 22 December 1944.



## News and Comment

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### THE PREVENTION OF TRENCH FOOT

The Surgeon General urgently recommends that every effort continue to be made by platoon and higher unit commanders to acquaint their troops with the factors involved in the cause of trench foot, and the preventive measures which are purely dependent on the individual's care of his feet. Proper footgear is highly important but alone will not solve the problem. The intelligent use of his footgear coupled with proper foot care falls on the individual soldier after he has been given the necessary instructions. It appears inevitable that, under the same climatic conditions, more casualties will occur in troops forced into relative immobility by heavy enemy fire for several days, than in troops less heavily engaged. Effective measures can be taken even then by the soldier to ameliorate the causative factors of trench foot, as pointed out in W.D. Circular No. 312, 22 July 1944, and War Department Technical Bulletin TB MED 81, 4 August 1944.

Instruction of the individual soldier in the care of his feet when under these conditions should be repeated often. As an additional reminder The Surgeon General's Office has a poster entitled "This Is Trench Foot" (see page 44). The wide distribution of these posters should make troops foot conscious. It is suggested that such posters be placed in suitable locations on trucks carrying personnel in combat areas in addition to the normal placement of such posters. If placed in the interior of trucks on a bulletin board on each side attached to the upper framework near the tail gate, all personnel will see them.

Although Army personnel carriers have not been extensively used to transmit reminders on health, the exploitation of this means is highly desirable. In this way the posters will reach those who are in most need of the reminder—combat troops going into action. Posters on other health subjects from time to time can be brought to the attention of combat troops by this means, thereby leading to better conservation of health when preventive measures depend in large part on the individual and unit commander.

In the matter of footgear, modifications have been made in the shoe pac to improve its "ground-grip" and to afford better support for the foot. It comes in full sizes and three widths. This shoe pac now is being issued against requisitions received by the quartermaster. These shoe pacs should be fitted properly when worn with one or two pairs of socks, wool, ski. The same applies to the combat boots which are usually fitted to be worn with one pair of socks. When sock combinations are worn, a larger size will be necessary to prevent constriction of the circulation. Socks must fit comfortably loosely but not loosely enough to permit wrinkling. The socks or sock combinations for

combat boots advised in order of preference are (1) socks, wool, cushion sole, two pairs; (2) socks, wool, cushion sole, and socks, wool, light, one pair each; (3) socks, wool, light, two pairs; and (4) socks, wool, heavy, one pair.

In keeping with similar pamphlets on health subjects from The Surgeon General's Office, another method of instruction is being used in the European Theater. It is a thin cardboard folder,  $4\frac{3}{4}$  by  $6\frac{1}{4}$  inches, printed for issue to enlisted men of the 36th Infantry Division. The folder entitled *YOUR ENEMIES: GERMANS AND TRENCH FOOT*, reads as follows:

1. The GERMAN and TRENCH FOOT are your most dangerous enemies during the winter months. You have been trained to protect yourself against the German and you must learn to protect yourself against trench foot. If you do not, you will become a casualty and suffer pain and discomfort. Ask some of the old men who have seen trench foot.

2. The principal causes of trench foot are sitting, standing, or lying with cold, wet feet. Lack of exercises of the feet and shutting off the blood supply to the feet by wearing too tight shoes, socks, and leggings are other causes. Trench foot can and does happen without freezing weather.

3. YOU CAN PREVENT TRENCH FOOT BY TAKING CARE OF YOUR OWN FEET. Not once every week or two or three days: do it every day. There may be an occasional instance when you can't do all the things to help, but you can still do most of them every day. Remember the following simple things and do them. No one else can do them for you:

a. At least once a day, and several times if possible, remove your socks and shoes, get foot powder from your squad leader and rub your feet with your hands. If powder is not available rub your feet without it.

b. At least once a day change to a pair of dry, clean socks. If this is not possible and your socks and shoes are wet, do the next best thing, take off the shoes and socks, rub your feet, wring out the socks, and put them back on if you have to. You have, or will be issued, two pairs of heavy woolen socks and two pairs of light woolen. One pair of the heavy woolen and one pair of the light woolen are to be worn with the light wool next to your feet; the other two pairs are to be kept on your person. The light woolen can be kept under the helmet liner; the heavy woolen either pinned inside your field jacket, inside the shirt, or in the pocket of the new type field jacket. You will receive one pair of clean light woolen socks daily with your rations; you must turn in a dirty pair in exchange. Wash the heavy woolen socks yourself; it can be done. If you have to continue wearing wet shoes, remove them several times daily to rub your feet. If you do not have the socks ask your squad leader to help you get them.

c. Exercise your feet. This is very important when you are not able to move about freely. It can be done even in a foxhole or dugout by wiggling of the toes or placing the feet against the end of the trench and pushing against it. Keep it up until the feet become warmer and the circulation of blood to the feet is good. This should be done at least once each hour.

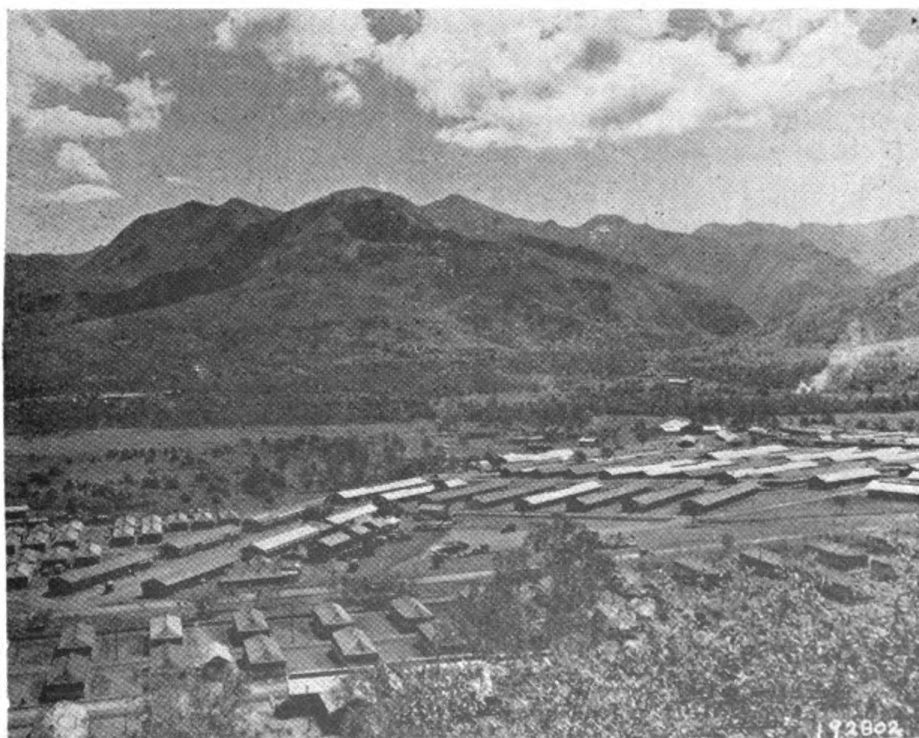
d. DON'T sleep with your shoes on if it can be helped, particularly if they are wet.

e. You have, or will be issued, a pair of shoe pacs (boots with rubber lowers) with TWO pairs of felt inner soles. One pair of the felt inner soles must always be worn with the shoe pac, the other pair will fit under the helmet liner. The felt inner sole will become damp from sweat and must be changed daily when the light socks are changed. Be sure that the shoe pacs are big enough to accommodate the heavy woolen sock and still not cut off the circulation to the feet. Remember the shoe pacs will cause the

foot to sweat and it is still very necessary that daily care be given to the feet in the same way as previously described. The heavy woolen socks should be changed daily if possible and at least every other day.

4. **TREATMENT OF TRENCH FOOT.** If you see a soldier who has not taken care of his feet, you will probably see a case of trench foot. You can recognize it by his complaints that his feet feel heavy, woody, and numb, and at first not painful. On feeling his foot with your hand, it is cold, looks swollen, is the white color of wax, with blue places like rash especially around the toes. When his feet are warmed, the color changes to red, the swelling increases, the feet feel hot to the touch, and are very painful. If you see this, it is **TRENCH FOOT** and it is important to know what to do as well as the things that can not be done: **DON'T RUB OR MASSAGE FEET AFTER TRENCH FOOT HAS DEVELOPED. DON'T PLACE SOLDIER WITH FEET NEAR FIRE OR TRY TO WARM FEET RAPIDLY. DON'T LET SOLDIER WALK IF IT CAN BE HELPED. DO PLACE SOLDIER ON HIS BACK WITH FEET RAISED ABOUT 15 INCHES ABOVE REST OF BODY. DO KEEP FEET DRY AND COOL. DO CALL MEDICOS SO THAT SOLDIER CAN BE TREATED.**

As a further means of constantly reminding troops, the suggestion has been made that a label, printed with brief and concise statements and directions regarding trench foot, be pasted on each ration packet at point of storage. In this manner the soldier would receive repeated reminders of what he can do to protect himself against trench foot. Comments on this suggestion and information concerning any trial of these mediums of instruction should be addressed to The Surgeon General, U. S. Army.



An Army hospital in New Caledonia. May 1944.

## SPECIAL SHOCK STUDIES

Special shock studies have been conducted by Majors D. Ebert and Charles P. Emerson on detached service with the auxiliary surgical group working in field hospitals. Their observations have been summarized in a recent report as follows: All patients with arterial pressure readings below 85 mm. of Hg., excluding cases with cerebral and cord injuries, were found to have an oligemia, the deficiency averaging 40 percent of the expected normal total blood volume. A significant reduction in blood volume, i. e., between 20 percent and 40 percent, was not invariably accompanied by hypotension. Hemoconcentration played no role in the pathogenesis of shock, as observed in this series of patients; on the contrary, spontaneous hemodilution of some degree was an almost invariable accompaniment of the condition. The coincidence of anemia and hypotension in these casualties proved to be a reliable index of marked oligemia, adequate treatment of which involved the transfusion of at least 2,000 cc. of whole blood. The pulse rate was found to be useless as an index of the degree of oligemia. Rapid blood transfusion in the treatment of oligemic shock did not appear to precipitate, or materially to enhance, the rate of bleeding in cases with chest or abdominal wounds. The rapid infusion of large volumes of crystalloid solutions—e.g., Alsever's solution employed as the blood diluent—produced but a small and transient increase in the blood volume. True irreversible shock was observed in but two instances; in each of these the total red cell volume on admission was less than 600 cc. Blood volume measurements were made pre- and postoperatively in a number of cases; the blood loss incident to various surgical procedures ranged from 500 cc. to over 3,000 cc.

As observed by these investigators, complete restoration of the formed elements of the blood to normal levels in all casualties presenting anemia associated with hypotension requires large transfusions of at least 2,000 cc. of whole blood. However, attention should be directed to the fact that a return to 70 or 80 percent of normal is sufficient to render the casualty safe for initial surgery and evacuation. In view of this fact and since cross-matching is necessary after every 1,000 cc. transfusion of whole blood, it would seem most practical and safe for *forward installations* such as field and evacuation hospitals to administer only enough whole blood to satisfy the immediate clinical demands. *General hospitals* of the base section, on the other hand, have blood available in greater quantity and should assume responsibility for effecting a complete return to normal of hematocrit and hemoglobin values. Restoration of hemoglobin values in association with reparative wound management was discussed in *The Bulletin*, February 1945, page 4.



### THE CIRCULATION IN TRAUMATIC SHOCK

Important studies on the circulation in traumatic shock in man were summarized in a recent Harvey Lecture by Dr. D. W. Richards, Jr.<sup>1</sup> The basic dynamic feature, failure of return of blood to the heart with diminished blood flow and tissue anoxia, long recognized from experimental evidence, can now be said to have been proved in human cases of shock. Direct measurements of the pressure of blood in the right auricle and of cardiac output were achieved by means of a long ureteral catheter introduced into a median basilic vein and thence passed along axillary and subclavian veins into the right auricle. Comprehensive studies were made on 92 patients admitted to Bellevue Hospital.

In skeletal trauma without evidence of shock, significant loss of blood volume and circulatory failure were not observed. In skeletal trauma with shock the total blood volume was reduced by 35 to 40 percent, and a fall in arterial pressure, failure of venous return to the heart, and a corresponding decrease in cardiac output were present. A closely similar picture was observed in shock due to hemorrhage without skeletal trauma. In cases followed through to recovery after treatment by blood or plasma, two trends have been apparent: first, a dilution of the blood plasma with the plasma protein concentration falling by about one gram percent; and second, in cases followed over several hours, an actual secondary increase in total circulating plasma protein along with a corresponding further inflow of fluid from the tissues.

In abdominal injury with shock, there were decreased auricular pressure, decreased cardiac output, and hemoconcentration. All cases had peritonitis with an acute serous or seropurulent exudate to account for the hemoconcentration. Relative maintenance of arterial blood pressure in this group as compared with the skeletal trauma cases, and relatively small decrease of the total blood volume were observed. The evidence suggests failure of the circulation on some basis other than reduction of the blood volume, but this requires further study. In burns with shock the picture was qualitatively similar to that in abdominal injury, except that the absolute loss in blood volume was larger.

Evidence was summarized for a strongly selective vasoconstrictor mechanism in shock, shutting off almost completely large organ systems or regions of the body not immediately necessary for survival. In shock, while the total blood flow decreases to half the normal value, the blood flow through the kidney may decrease to one-tenth or one-twentieth, perhaps even less in extreme cases. One patient in deep shock for many hours developed acute renal insufficiency similar to the

1. Richards, D. W., Jr.: *The Circulation in Traumatic Shock in Man*, The Harvey Lectures (1943-1944), Series 39, pp. 217-253. Lancaster, Pa.: The Science Press Publishing Co., 1944.

crush syndrome studied by Bywaters.<sup>2</sup> Spontaneous and abrupt failure of this selective vasoconstriction may precipitate fatal collapse.

The Trendelenburg, or foot-up, position increased the cardiac output in patients with moderate reduction of blood volume but was ineffectual when there was marked reduction of blood volume. Cardiac output was not increased by the administration of pressor amines. The effects of alcoholism superimposed on those of shock were most unfavorable. Fat embolism was not observed in the series.

A special feature of the cases of burns was the frequency with which arterial oxygen unsaturation occurred without recognizable pulmonary pathology. Inhalation of hot or irritant gases was not a factor in all cases. The condition persisted from three to seven days after injury. In patients with chest injury, oxygen unsaturation became more marked after recovery from shock and following transfusion, as if there were a tendency to pulmonary congestion aggravated by increase in blood volume. No satisfactory evidence was obtained on the question of failure of the heart in acute traumatic shock.

Persistent shock was characterized by the accumulating effects of tissue anoxia. The brain appeared to fail first. Pulmonary edema was a frequent and difficult complication. Nitrogen retention and oliguria were also observed. The status of oxygen therapy needs further definition.

When whole blood has been lost in large amounts, replacement by plasma alone will produce an acute anemia. This may actually limit the quantity of plasma that can be given safely. Failure of sustained improvement after the administration of 1,000 to 1,500 cc. of whole blood usually indicated continued bleeding. The author emphasizes the need for further studies on the subsequent maintenance of the patient after he has been resuscitated from shock.

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#### DENTURES LISTED ON IMMUNIZATION REGISTER

The dental officer who finds a denture present which has not been previously recorded, or who inserts a new denture, will (W.D. Circular No. 32, 27 January 1945, sect. IV, par. 2d) obtain the individual's copy of W.D., A.G.O. Form 8-117 (Immunization Register), make the proper entries thereon, and forward the form to the personnel officer who will transcribe these data to the record copy and return the individual's copy to him. The same procedure will be followed in the case of the medical officers performing a refraction or writing a prescription for spectacles, or noting an allergic reaction to drugs, vaccines, sera, and other biological agents.

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2. Bywaters, E. G. L.: Ischemic Muscle Necrosis; Crushing Injury, Traumatic Edema, the Crush Syndrome, Traumatic Anuria, Compression Syndrome: Type of Injury Seen in Air Raid Casualties Following Burial Beneath Debris, J.A.M.A., 124:1103-1109, 15 April 1944.

### PORTABLE RESUSCITATOR

A new portable, bellows type resuscitator (Med. Dept. Item No. 3725800) has been adopted by the Army and is being issued for distribution to medical units attached to combat troops. The apparatus consists of an expansible, bellows type bag of about 1,500 cc. capacity, a face mask, an elbow adapter, a metal pharyngeal airway, intake valves, and a pressure limiting valve which prevents pressures in excess of 20 mm. of mercury being exerted during resuscitation. The entire assembly weighs less than two pounds and is packed in a case 6 by 6 inches. This resuscitator should meet all needs for artificial respiration in the field. It can be removed from the carrying case and put into operation in a few seconds' time. There are no adjustments to be made. All valves are automatic.

When resuscitation is mandatory, there should be no delay in taking the necessary measures. Artificial respiration by manual methods should be instituted at once and continued until an apparatus for artificially inflating the lungs by positive pressure can be put into operation.

In all cases, with the possible exceptions of drownings or hemorrhage from the nose or mouth, the patient should be placed on his back. The mouth should be cleared of all foreign material before the pharyngeal airway is put into place. The face mask is placed and held tightly over the patient's nose and mouth. The chin must be held up with the head extended to prevent pharyngeal obstruction (figure 1).

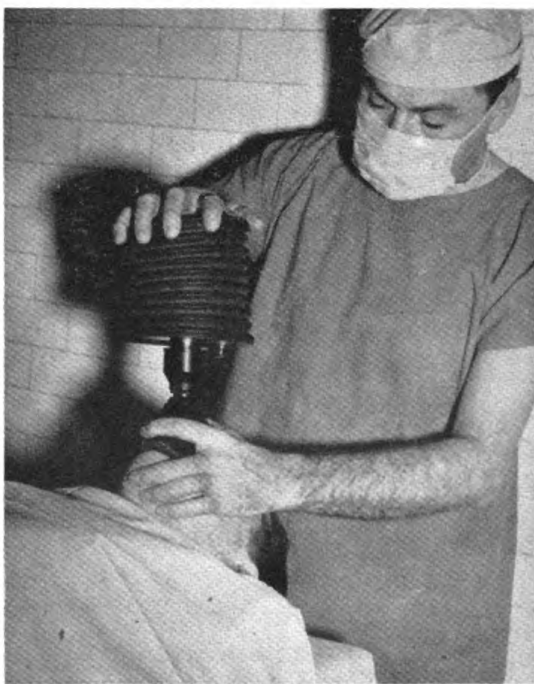


FIGURE 1

The bellows is raised and forcibly compressed rhythmically fifteen to eighteen times a minute. During inflation the patient's chest will be seen to expand. If expansion is not noted, the airway must be explored immediately and the obstruction relieved. If oxygen is available, and it seems advisable to administer it to the patient, a rubber tube leading from the oxygen tank can be attached to the oxygen inlet valve on top of the bellows without interrupting the rhythm. An oxygen flow of 5 to 6 liters per minute is recommended.

Once the apneic patient begins to breathe, respirations are usually irregular and shallow. When this occurs, the operator should synchronize forcible inflations with the patient's own inspiratory efforts, at the same time continuing the fifteen to eighteen times per minute rate, until normal automatic respiratory rhythm has been established by the patient.

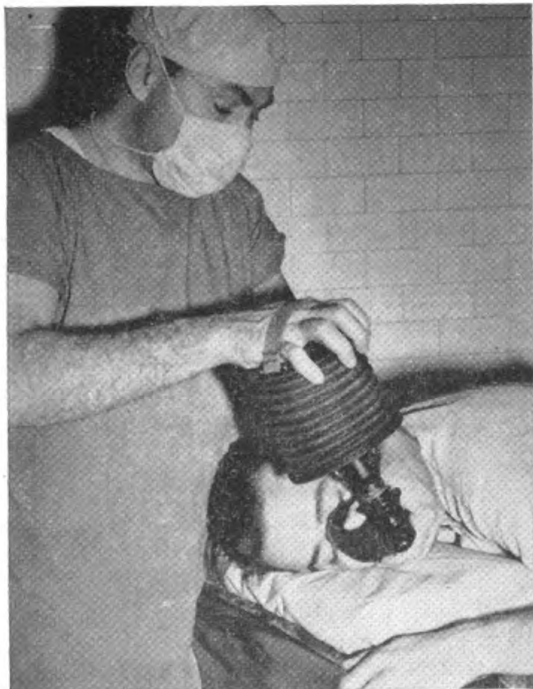


FIGURE 2

In cases of drowning or patients who are bleeding from the nose or mouth, it may be desirable to carry out artificial respiration with the patient in the prone position. This can be done very satisfactorily by placing the elbow adapter between the bellows and the face mask before placing the apparatus in operation (figure 2).

There is no rebreathing and no accumulation of carbon dioxide in the bellows. The valves are arranged so that gases from the lungs are expired directly into the outside air. The lungs deflate because of their elasticity and the elasticity of the intercostal muscles. A mixture of the gases from the lungs and the air or oxygen in the bag is impossible. Each stroke of the bellows supplies only fresh air or oxygen to the lungs.

#### AIR TRANSPORT OF TUBERCULOUS PATIENTS

From July to December 1944, about 6,000 patients were flown from Pacific area to Hamilton Field, California, and of these, 140 were tuberculous. In general, the tuberculous patients were transferred promptly to Fitzsimons General Hospital, Denver, Colorado, or Bruns General Hospital, Santa Fe, New Mexico, the majority, in recent months, having gone to the latter hospital. About one-third of all patients evacuated to that hospital now arrive by air, and two-thirds of these are litter patients. Air transportation of tuberculous patients from overseas to the United States and from points of debarkation to hospitals in the zone of the interior has proved practical for the majority of tuberculous patients, has been less tiring than train transport, and has been attended by no significant untoward complications. As a general rule it has proved unwise to transport pneumothorax patients by air.



### CONDITION OF RETURNED CASUALTIES

Reports from the chiefs of orthopedic sections in about twenty named general hospitals contain remarks relative to the condition of casualties received from the various theaters. The reporting officers were unanimous in praise of the excellent surgical treatment and the reduction and immobilization of fractures. With few exceptions, patients had traveled in comfort and arrived in good condition. The following comments abstracted from these reports are presented as constructive criticism in order further to perfect the preparation of casualties for transportation to the zone of the interior.

#### Upper Extremity

1. Hands are often immobilized too extensively and too long with resulting stiffness, especially of the metacarpophalangeal joints. The wrist should be placed in moderate dorsiflexion, the fingers in moderate flexion, and the thumb in opposition, which is the position of optimum function. The cast on the hand should not extend beyond the proximal palmar crease, in order to permit free motion of the metacarpophalangeal joints. If support is required because of a nerve lesion, additional support should be flexible or removable.

2. The forearm should never be immobilized in supination but should be kept in neutral or slight pronation. This is especially important where there is infection and danger of ankylosis of the elbow.

3. Where hanging casts are used for humeral fractures, active swinging exercises of the shoulder should be started early.

#### Lower Extremity

1. Hyperextension of the toes should be avoided. If a plaster toe piece is used, it should be extended in line with the sole and should not be pushed upward. Where active toe motion is possible, a loop of wire or loop of plaster is preferred to the solid toe piece, since it will prevent pressure on the toes and at the same time permit active exercise.

2. The ankle should be placed in a neutral position. Equinus position is not common, but when it occurs, the resulting disability is difficult to overcome.

3. Flexion of the knee should be kept to a minimum. There is some disagreement on this point, since flexion is often required to prevent rotation of fragments. However, persistent flexion of the knee is difficult to correct and interferes with function and, therefore, only slight flexion should be provided.

4. Fractures of the upper tibia in many instances require a spica.

5. Injuries involving the hip require immobilization in the optimum position of function in view of the danger of ankylosis. In the adult, this position is about 15 to 20 degrees' flexion, 0 to 5 degrees' abduction, and neutral or slight external rotation comparable to the normal extremity. Since flexion deformity tends to progress, it is advisable to maintain very slight or no flexion during the early period of treatment.

6. Fractures of the femur in particular should be kept in traction in the zone of communications until union will permit transportation in plaster unless there is no possibility that union will occur before arrival in the zone of the interior. Subtrochanteric and intertrochanteric fractures, in particular, develop union with marked deformity which is difficult to correct.

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Prepared by the Surgical Consultants Division, Surgeon General's Office.

### General

1. Patients should be instructed in static muscle contraction which can be performed under plaster in many cases. This will facilitate recovery.
2. Secondary closure of wounds has been commended in most instances.
3. Delayed internal fixation has been performed in a number of cases before wound healing. Exact data have not yet been accumulated, but various hospitals report that 25 to 40 percent of these cases require removal of metallic fixation material to stop drainage and promote healing. Further careful observation and evaluation of this method of treatment are necessary, and in the meantime it should be reserved for selected cases which definitely require internal fixation.

### Amputations

1. Skin traction has been effectively applied to the majority of amputations; however, the elastic traction tends to become loose and requires constant attention. This should be observed by personnel responsible for cases during transit.
2. Below-knee stumps should have skin traction with the knee in full extension. However, below-elbow stumps should have skin traction with the elbow flexed to a right angle.
3. Cast and banjo traction is an effective method of ambulatory treatment, but not so effective as the weight and pulley method of bed treatment. The latter should be continued while awaiting transportation and during transit whenever feasible.
4. Prolonged skin traction is preferred by all amputation centers to early secondary closure or early skin grafting. The maximum effect of skin traction should be obtained prior to secondary surgery. This does not preclude the preservation of short flaps of good skin at the site of amputation which will permit early spontaneous healing. Skin grafting is justified only after the maximum healing has been obtained by traction in those cases where it is considered necessary before final stump revision and in similar cases which cannot be evacuated promptly. In no case should the skin be taken from the extremity with the amputation stump.
5. The prosthetic requirements of a stump are best determined at the amputation centers. It is requested that surgeons advise patients that further surgery will probably be necessary. When told that an amputation or revision is the final operation, it is difficult to obtain the patient's concurrence in case further surgery actually is required.

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### PRETECHNICAL TRAINING FOR CONVALESCENT SOLDIERS

The Quartermaster Corps will offer pretechnical training in the arts and trades as part of the conditioning of soldiers in convalescent hospitals. The courses, based on instruction at Q.M.C. training centers, will include canvas and leather work, sewing machine operation, clothing and textile repair, electrical work, topographical drawing, warehousing, and utility repair. Instructors and materials will be provided by the Quartermaster Corps. The training will be part of the Medical Department program to recondition hospitalized soldiers for return to service or re-entry into civilian life.

**CHEMOTHERAPY IN POSTTRAUMATIC PERITONITIS**

In a circular letter distributed in one theater of operations it has been stated that preliminary evaluation of penicillin therapy for fecal contamination of the peritoneal cavity is encouraging but at the present time is inadequate for comparison with sulfonamide therapy. In view of the difficulties in maintaining a fluid intake adequate to safeguard sulfonamide therapy in this group of cases, substitution of penicillin may be made at the discretion of the surgeon. The following extract is taken from a report of 243 cases of peritoneal penetration, prepared by Major Pat R. Imes. This report does not give a positive answer to the question, but at least it fails to show any great hazards in allowing surgeons to use their own judgment in prescribing the chemotherapeutic regimen:

Although perhaps too small a group to justify conclusions, it is our impression that the local use of either drug affords no additional protection against peritoneal infection. Our experience fails to indicate any particular advantage of one drug over the other or that their combination as employed has proved more efficacious than either alone. Indeed it is impossible to know just to what degree either drug is effective, if at all. Of the one hundred and fifty-seven cases with hollow visceral perforation, one hundred and forty-eight of which were of the small intestine and colon, there were only seven deaths attributed to preventable peritonitis—a much smaller number than would be expected without chemotherapy. That figure is even more striking when the frequency of extensive peritoneal soiling and prolonged time intervals between wounding and operation are considered.

In addition to the infrequency of deaths from peritonitis, there has been no instance of a diffuse suppurative process. We have yet to see an abdomen distended with a large quantity of free pus as was so often found at autopsy following intestinal perforations and operations before the advent of effective chemotherapeutic agents. The peritonitis observed has been chiefly of the fibrinous plastic type producing numerous points of mechanical obstruction and ileus. Whenever purulent exudate has been observed, it has been localized. Without exception those deaths attributed to peritonitis have occurred in the most severely wounded cases, which barely escaped death from shock and only then following the use of large quantities of plasma and whole blood. At autopsy in such cases, it is difficult to ascertain whether the severe and prolonged shock, the peritonitis, or the usual bronchopneumonia in the lower lobes is chiefly responsible for the fatality. We believe that it is the combination of those conditions which prove fatal and without the other two, recovery would frequently take place from peritonitis alone. Certainly, without the peritonitis recovery would undoubtedly occur from shock and the pulmonary disturbance in many instances. There were eighty-six cases with peritoneal penetration, but without gastro-intestinal perforations. In no case of this group was there significant peritoneal infection. The combined use of penicillin and the sulfonamides other than the mere local application of the latter appears to have certain theoretical advantages. Recently, in a single case such was the treatment and with, thus far, a favorable outcome.

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Extracted in Surgical Consultants Division, Surgeon General's Office.



### FUMIGATION AND BATH COMPANY

The quartermaster fumigation and bath company has a twofold mission in the field and at permanent installations: (1) to kill parasites which transmit diseases, and (2) to improve morale by removing annoying parasites and promoting cleanliness. In the field the company is normally broken down into the two component platoons, operating separately. It may

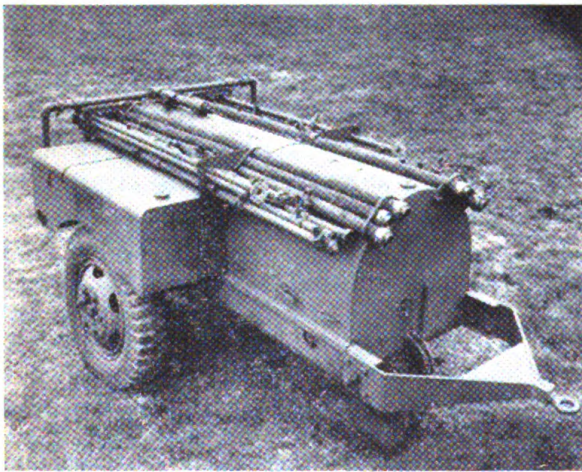


FIGURE 1. Bath trailer company with disassembled shower unit.

operate in conjunction with mobile laundry units of equal processing capacity or with both a laundry company and a salvage repair company. When operating in conjunction with laundry elements only, the combination may provide individual service for troops, washing, fumigating, and returning garments or equipment to the original users. The company



FIGURE 2. Bath trailer in operation. The auxiliary pump is not needed here since the trailer is close to the water.



may also operate as a component of a quartermaster battalion. Under conditions which do not permit operation of the bath unit, the fumigating facilities can still be used to disinfest troops. A fumigation and bath company can be expected to serve about 3,600 troops during an operating day of twelve hours.

The bath unit of the company consists of a water heater, a pump to draw water from a nearby stream, and a frame which supports twenty-four shower heads. All of this equipment is assembled on a trailer which has a hinged towing frame. The heater is provided with a gasoline engine which operates the oil-burner blower and the pumping system; in addition to the permanently installed main water pump, there is an auxiliary pump which is used as a booster. The quartermaster fumigation and bath platoons in the field will usually operate in the rest areas at the rear of the combat zone.

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#### PLAGUE IN DAKAR

Dakar, the largest city in French West Africa, was the scene of an outbreak of 567 cases of plague in 1944, of which 91 percent were fatal during the period from April through November. Human plague has occurred in Dakar repeatedly in the past, but there had been no recorded cases since 1937 until the outbreak of 1944. All cases in the recent outbreak were in native blacks except one in a Syrian and three in French Europeans. Environmental conditions at Dakar were favorable to the spread of plague. The population of the crowded native section had been further increased by a wartime influx, causing extreme congestion. As many as fifty persons used a 20 ft. by 20 ft. room in some of the thatched huts, sleeping in shifts, huddled together on sand floors. At the markets, throngs of people were in intimate contact daily, buying food and visiting. With food scraps, refuse, and trash littering the compounds, with domestic animals in and around the dwellings, and with sanitary facilities practically nonexistent, infestation with vermin, rats, and fleas was universal.

The first case of plague occurred in an arsenal guard who had been occupying a guard hut adjacent to the crowded harbor area. Despite the quarantine of the arsenal area and attempts at disinfestation, six additional cases occurred in the arsenal by 15 May. When the spread of plague continued, the French port authorities instituted precautions against movements of rats from ships in the harbor, including the maintenance of a one-meter distance between ship and dock, the raising of all gangplanks and loading nets at night, and the use of rat shields on all hawsers. The precautions were not always carried out and

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Abstract of a report by Major Paul M. Lewis, M.C., A.U.S., Captain Milton H. Buehler, Sn.C., A.U.S., and Lieutenant (j.g.) T. Roy Young, Jr., H-V(S) U.S.N.R.

shields for hawsers were not always available. To protect American personnel, the water front was placed "out of bounds," shore leaves were cancelled, and personnel on indispensable business going into the area were required to wear protective clothing treated with repellent. By 6 June the entire city was declared "off limits" for American personnel except when on indispensable business. All natives working for American personnel were laid off or were given plague immunization and required to dust their clothes and their homes with DDT powder. Natives working at the U. S. Army station hospital were required to bathe and change clothes before work, and, in August, were restricted to and quartered in the hospital compound. The homes and offices of all American personnel, including the State Department and various contract companies, were treated with DDT. On 7 June, the U. S. Naval air facility abandoned its quarters in Dakar and moved to the Army air base some 6 miles from the city.

With the continuing spread of plague in June and the discovery of infected rats in seven locations in the city, the French medical authorities closed all cinemas, sports arenas, and similar gathering places. The cinemas remained closed until 8 July when they were treated with DDT and allowed to reopen—but with the requirement of weekly disinfection with cresol solution. All travelers, both from and into the city, were required to exhibit a "passeport sanitaire" showing that they had received antiplague inoculation. Entire blocks of stores and warehouses near one in which a French business executive had become infected were fumigated with chloropicrin gas, and rat burrows were systematically fumigated with sulfur dioxide in the arsenal area, the railroad yards, and in parts of the harbor area and the native section called Medina.

The control measures used by the French, when a new plague case occurred, began with disinfection of the house and yard with cresol solution to kill both infected fleas and bacilli. Where possible this was done by spraying from a fire truck carrying a tank of cresol solution; in inaccessible areas, the disinfection was achieved by mixing the cresol solution in wash tubs and sprinkling the area from garden sprinkling cans. Next, there was a fumigation with chloropicrin gas of the house in which the case occurred, and occasionally of adjoining houses. This was done by covering the small native hut with tarpaulin, pouring liquefied chloropicrin over the floor, and "sealing" the house for twenty-four hours. Following this, rats in nearby burrows and debris piles were destroyed with sulfur dioxide. This program was supplemented by assistance from the Americans, who dusted the houses and as many natives as possible with 10 percent DDT.

It soon became apparent that these spot measures were not adequate to halt the plague, although the dusting was effective where used in eliminating the heavy flea infestation. The French medical authorities stated the assistance with DDT was a major

factor in preventing a greater increase in the disease, but it was felt by the Americans that control could come only by a complete and comprehensive program encompassing at least all the native sections of the city. After some delay and negotiation, the following program was undertaken on 24 October. Because the seasonal decline of the plague incidence had begun, the effectiveness of this type of treatment in halting a plague outbreak can not be evaluated. The last two cases of plague occurred on 22 and 25 November, which could indicate contraction of the disease prior to the dusting. The native section was divided into zones which could be surrounded by a cordon of 200 to 300 gendarmes. To obviate natives leaving who did not wish to be detained, the zone was selected the night before the operation and the cordon was placed at 0500. Four or five "outlet stations" were established to permit natives to leave for work without undue delay. At these stations dusting began at about 0600 by three or four native workers who applied 10 percent DDT dust with Hudson plunger-type dusters to all persons leaving, beginning at the ankles, dusting under the various layers of clothing, then dusting at the waist—front and rear, then at the sleeves and neck, and finally the hair. The clothing was held out and down to form an "envelope" for the dust which could be seen through the fabric as it was applied on the inside. The release of the workers was completed in about an hour, when an inner cordon was placed to isolate individual blocks in which the dusting crew would dust all the remaining people house by house. When a block was completed the outer cordon would move in. By this system it was felt that less than 5 percent of the people were not dusted.

Simultaneous with the dusting of the people "at home," treatment of the houses was begun by dusting with 10 percent dust and by spraying with 5 percent solution in kerosene. Spraying was the preferred method, but to complete the program in the shortest possible time the spraying was supplemented by dusting, permitting the use of more of the available equipment. The spraying was performed using a Binks paint-spray compressor modified by Captain Louis J. Berman, Sn. C. The twenty-gallon paint container was replaced with a Hudson three-gallon cylinder, manual pressure-sprayer tank; the nozzle of this Hudson sprayer was replaced with a Binks "Thor" paint-spray gun to which the compressed air was delivered. An occasional pump or two with the plunger delivered sufficient liquid to the paint spray gun. The other compressor was a two-wheeled, pneumatic-tired Ingersol-Rand "Mobile-Air" unit, which was very satisfactory. Two spray units could be operated from this compressor simultaneously.

In spraying, attention was directed to the floor and lower walls, and to the beds which were heavily infested with bedbugs as well as fleas. The upper walls received a light dosage. An accurate count of people dusted was not kept, but it was estimated that about 125,000 persons were dusted. As a further

safeguard, all public houses, such as cafes, restaurants, bars, brothels, cinemas, etc., were sprayed with 5 percent DDT solution. An extensive survey showed a very high reduction in the flea population. Out of 316 houses infested before spraying, all but 7 were completely free of fleas two weeks after treatment.

There was a very large rat population. The Norwegian, the Alexandrian, and the common rat were about equally numerous, and the Camtchouli rat was less so. Since the outbreak of plague, 10,500 rats were caught, mostly alive in wire-cage traps, by the French Health Service. Some rats were killed with sulfur dioxide or chloropicrin. Of 3,501 rats examined in the laboratory, 65 were infected with plague. With few exceptions, the infections were limited to the Norwegian and Alexandrian rats. In addition, two dead cats were found to be plague infected. After the outbreak, the French Health Service started a general rat control program using trapping and gassing. Around American installations, diligent rodent control was maintained by regular trapping and poisoning. Poisoning could not be used in the native sections because of the danger to children and domestic animals.

The local French medical authorities felt that the low incidence of plague in the limited group of intimate contacts given early treatment with sulfadiazine indicates that this therapy will be a valuable prophylactic measure in any future outbreak. It is contemplated that, when an initial plague case occurs, the entire quarter will be quarantined under police guard and that, in addition to the usual control measures, all individuals within the quarters will be required to take prophylactic sulfadiazine treatment. It was the French opinion that bacteriophage was indispensable and that best results were obtained with combined sulfadiazine bacteriophage therapy. Sulfapyridine and serum were felt to be ineffective.



U. S. Army "medics" promptly aid wounded infantrymen in an advanced position in France. 24 July 1944. Signal Corps photograph.

### SUPRAPUBIC CYSTOSTOMY IN SPINAL CORD INJURIES

A recent overseas report by Colonel R. G. Spurling included the following statement regarding the indications for suprapubic cystostomy in spinal cord injuries:

There has been a gradual evolution in our thinking in the matter of bladder drainage in this group of patients. It was originally planned to use tidal drainage for the first four to five weeks and then, if sphincteric function had not returned, to do a suprapubic cystostomy. We have found from bitter experience that tidal drainage is not practical in wartime and for the most part has been abandoned in favor of early suprapubic cystostomy or perineal urethrostomy.

This statement presents the reason why many cases of spinal cord injury are received in the zone of the interior with suprapubic cystostomies. During the course of rehabilitation in general hospitals in the zone of the interior, the cystostomy in a considerable number of these cases is allowed to close, and tidal drainage is then instituted and maintained until the development of an automatic bladder has been effected.

The proper technique of performing a suprapubic cystostomy was presented by Prather in the October 1944 issue of *The Bulletin*. He pointed out that by carefully reflecting the peritoneum upward to the uppermost portion of the bladder and placing the suprapubic tube at the upper end of the bladder and of the fascial and skin incisions, the difficulties with suprapubic cystostomy can be diminished. This position of the tube has the following advantages: (1) Avoids direct contact between the tube and the trigone of the bladder, which when present produces edema and is conducive to an inflammatory reaction, vesico-ureteral reflux, and ascending urinary infection. (2) An oblique sinus rather than a short sinus is formed so that, when eventual closure of the sinus is desired, healing will take place more readily. (3) Avoids the danger of periostitis of the pubis due to contact of the tube against the symphysis. (4) Facilitates any subsequent intravesical surgery which may be required for removal of bladder stones.

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### DENTAL NEEDS OF MEN FROM OVERSEAS

A report from a redistribution station in the United States examining the mouths and teeth of men returning from overseas, indicates that in 4,060 men, only 9 percent were in class I. This means that about one man in ten required an extraction or some emergency treatment, including construction of a denture if the individual had insufficient teeth to masticate the average food. About one man in every four requires emergency dental treatment at the time of induction. This report further indicates that about 45 percent of the men returning require one or more fillings, while about 40 percent require no dental treatment.



### OCCUPATIONAL THERAPY

The purpose of the reconditioning program is to return men to duty in the shortest possible time in the best possible physical and mental condition, or to discharge them to civilian life in prime condition to resume their responsibilities. Occupational therapy is only one phase of the program, but it is



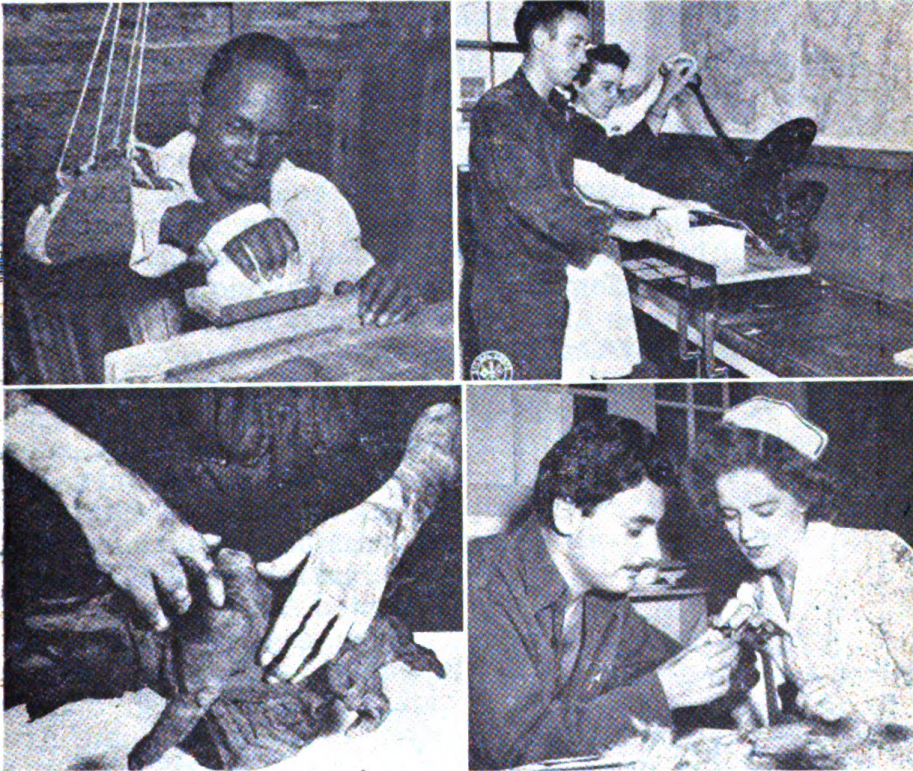
(1) Farming is part of the reconditioning program for patients. (2) Patient gaining experience in use of power machine and confidence in his ability to use his prosthesis. (3) This patient studied leathercraft during his hospitalization and hopes to make it a full-time job after the war. (4) Convalescents study motors with instructor (right).

important in supplementing the efforts of medical officers. In bringing the mild exercise and mental relaxation of constructive work to bedridden and confined patients, the Medical Department of the Army speeds up their recovery. In Army hospitals today it is on a much broader scale than anything previously attempted under civilian or military sponsorship.

Occupational therapy does not mean vocational training. Major skills are not taught to patients, but the activity intrinsic in any type of occupation is used curatively in the treatment of the aftermath of disease or injury. The doctor in charge of the case writes the prescription for occupational therapy and the therapist devises an activity which will fill the order, based on her resources and her study of the personality and interests of the patient. The work done is under continual supervision.



Occupational therapy has other values in Army general hospitals. For patients who do not require therapeutic exercise, the occupations available offer relief from boredom. However, said Mrs. Winifred C. Kahmann, chief, Occupational Therapy Branch, Reconditioning Consultants Division, Surgeon General's Office, the Army Medical Department has tossed out some of the occupations previously familiar in hospital wards—basketry, cane and reed work, knitting, embroidery,



(1) Complete paralysis of axillary nerve following an injury in Bizerte, North Africa. Patient's hand here is strapped to a sanding block. In this type of paralysis, occupational therapy can only attempt to increase circulation and prevent further atrophy due to inactivity. (2) Wounded by shrapnel in Tunisia, this soldier exercises his arm on a printing press. (3) The bomber in which this soldier was radio operator caught fire and crash landed causing burns which resulted in contracture of his fingers. Clay modeling provides beneficial resistive exercise for treatment of burned or injured hands and fingers. (4) Fly-tying is a good treatment measure for fine finger motions and coordination and a pastime for one who likes to tie his own fishing flies.

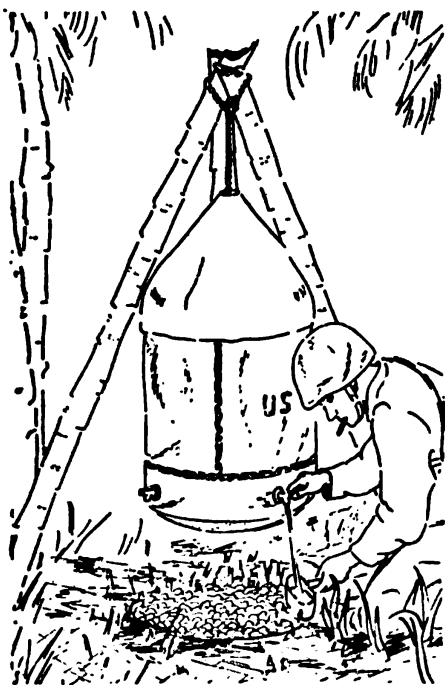
and making hooked rugs. For special cases, or in hospitals devoted to the care of W.A.C. and Nurse Corps members, they may be used.

The shortage of trained occupational therapists is so serious that the Army is subsidizing the training of several hundred qualified women in a number of colleges. The courses consist of four months' intensive training in any of seven

accredited schools and eight months' clinical practice in Army hospitals. Qualifications include recommended age limits of 21 to 35, a B.S. or A.B. degree with a major in arts and crafts, industrial art with teacher training experience, home economics with three or four manual skills, or fine or applied arts. Applications are made through the U. S. Civil Service Commission in Washington, D. C.

#### SELF-COOLING WATER STERILIZING BAG

A new water sterilizing bag listed as bag, canvas, water, sterilizing, porous, complete with cover and hanger, will be issued in all battle areas as soon as delivery can be made. Prior to World War II the fabric of the Lyster bag was made from flax. This material allowed its contents to cool when high exterior temperatures prevailed. The fabric absorbed water from within and then permitted slow seepage to the surface where evaporation took place. Conversion of water into water vapor requires and takes up heat, and in this process the cooling of the Lyster bag was effected.



In the present war when flax became scarce, a rubberized nonporous fabric was substituted. Under desert and tropical conditions this substitute was not satisfactory, because of the bag's inability to "sweat" which prevented self-cooling.

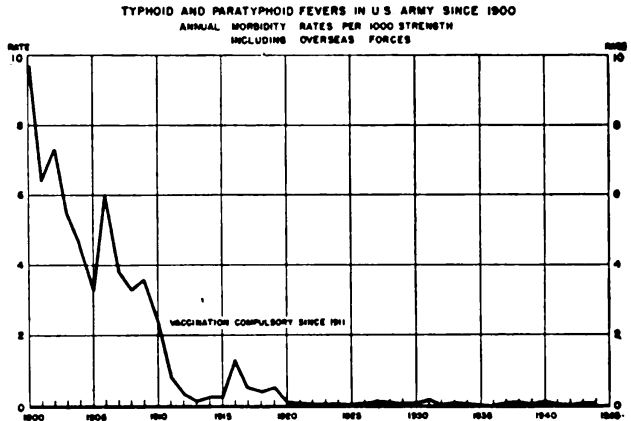
The new replacement is a 36-gallon, self-cooling, hooded, water sterilizing bag, made of cotton duck dyed to an Army standard olive drab shade number 7 and impregnated with chemicals. It allows seepage of about 0.2 to 0.5 cc. of water per square centimeter per hour. This causes a fall of about four inches in the water level of the bag over a twenty-four-hour period.

In a hot dry climate the new chemically treated duck keeps drinking water about 15° F. cooler than the prewar flax fabricated bag. In a hot, humid atmosphere the cooling is not so pronounced because evaporation is greatly restricted. The flat type cover is also being replaced in the new issue with a cone-shaped hood which lessens the probability of contamination by dust, dirt, and insects.

From the Sanitation and Hygiene Division, Preventive Medicine Service, Surgeon General's Office.

### TYPHOID AND PARATYPHOID FEVERS

Despite the unsanitary conditions to which troops are frequently exposed during wartime it appears that no increase has occurred in the incidence of typhoid and paratyphoid infections during World War II. This good showing can be ascribed to the Army program of compulsory vaccination against these infections, in conjunction with sanitary controls over food and water for troops. While reports are incomplete as yet for 1944, it is estimated that during the three years of war (1942-1944) about 250 cases of typhoid fever and



500 cases of paratyphoid fevers occurred among Army troops, an average annual morbidity rate from these diseases of only 4 cases for every 100,000 troops exposed. About 75 percent of the total cases were reported among troops overseas, where the rate of infection was about six times that among troops in the United States. During this period, the morbidity rate from typhoid and paratyphoid infections was about one-tenth that of the first World War.

### CONCERTS IN GENERAL HOSPITALS

The Surgeon General's Office has arranged for a series of concerts to be given in nineteen general hospitals east of the Mississippi by the First Combat Infantry Band, a new organization composed of fifty-six infantrymen representing virtually all major battle fronts, many of whom before the war were members of well-known orchestras. These infantrymen-musicians have served in many capacities—some as machine gunners, riflemen, linesmen, radio operators, medical technicians, and litter bearers. Many of them have received awards for exemplary conduct in action against the enemy and for gallantry in action. They will present, during a tour of two months, not only to the wounded in Army hospitals but to the public, music close to the hearts of infantrymen on all American battle fronts, and in addition native numbers (including a Fijian song). During the tour, this new unit of the Army Ground Forces will also give concerts sponsored by the Treasury Department and civic organizations in the interest of the war loan campaign, and radio programs. The series of concerts opened at Newton D. Baker General Hospital, Martinsburg, West Virginia, 12 February.

**COMBAT PSYCHIATRY\***

Opinion is unanimous, among not only psychiatrists but all officers, that leadership is the greatest single factor which, by making for morale and confidence, results in lowering the incidence of neuropsychiatric casualties. After every campaign, one division commander lectures to every unit of his command on the tactics and strategy whereby the unit carried out the missions assigned to it. This general, starting at dawn on Christmas day, visited every unit in his division personally to extend his greetings. He trains his officers to know their men, to take a personal interest in them, and actually to lead them in combat. Morale is high in this division, which did much of the fighting. The soldiers of this division have faith in themselves, their weapons, and their leaders—three factors of utmost importance in making for low incidence of neuropsychiatric casualties. A division neuropsychiatrist has developed an unusually effective program which aims at increasing morale and preventing minor psychiatric disorders. This program is intimately integrated with the information and education program. The division psychiatrist serves in a dual capacity. Classes in various subjects have been organized among the units, and many men have been stimulated to take courses in the Armed Forces Institute. Hobbies are encouraged. Discussions on subjects of wide interest are held. These activities likewise prevent the development of apathy from monotony and leave little time for soldiers to dwell on hardships. This psychiatrist has effected close liaison with G-1, thus effecting proper reassignments of mild psychoneurotics who are unfit for combat but who can do a good job in a service unit. The G-1 receives morale reports from every unit surgeon and chaplain weekly, and from the division neuropsychiatrist at intervals depending on the incidence of neuropsychiatric casualties. The consolidated reports are turned in to the chief of staff who takes up the problems of morale with each unit commander. Weak company commanders are relieved and reclassified or reassigned. All of these measures make for high morale and a low incidence of neuropsychiatric ineffectives in the division.

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**GENERAL OFFICERS OF THE DENTAL CORPS**

Colonel Rex McKinley McDowell, D.C., has been appointed temporarily a brigadier general in the Army of the United States, with rank from 4 January 1945. General McDowell is the third dental officer in the history of the U. S. Army to become a general officer; the other two are Major General Robert H. Mills, present director of the Dental Division, Surgeon General's Office, and the former director, Brigadier General Leigh C. Fairbank, retired. General McDowell has been designated deputy director of the Dental Division.

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\*From the Neuropsychiatry Consultants Division, Surgeon General's Office.



### RESEARCH BOARD FOR NATIONAL SECURITY

The National Academy of Sciences announced on 12 February in a joint statement by the Honorable Henry L. Stimson, Secretary of War, the Honorable James Forrestal, Secretary of the Navy, and Dr. Frank B. Jewett, president of the National Academy of Sciences, the establishment of the Research Board for National Security.

The objective of the Board will be to continue, pending final consideration by Congress on creation of an independent agency, the close cooperation between civilian scientists and the armed services which has proved to be a vital element in the prosecution of the war. This Board includes many of the features of the Office of Scientific Research and Development, which as a wartime agency has successfully mobilized civilian scientists and coordinated their work with the requirements and operations of the armed services. The charter of the new Board provides for up to twenty civilian members selected with the advice of the Chairman of the National Research Council and the Council of the National Academy of Sciences; also up to ten high-ranking officers each from the Army and the Navy, nominated by the respective secretaries, all to be appointed by the president of the Academy. The members of the Board serve as such without compensation. The research activities are to be carried out under contracts whereby existing laboratories and facilities will be used wherever practicable.

The charter specifies: "It shall be the duty of the Board to formulate programs of scientific research and development relative to problems of national security, to direct and conduct the scientific study of such problems and to advise the Secretary of War and the Secretary of the Navy on the applications of science to national security. Science is here broadly interpreted to include the employment of scientific method of analysis, experiments, and tests in any branch of science or technology, including engineering, medicine, psychology, and biology. Special consideration shall be given to possibilities arising from progress in science and technology. The Board shall, in no way, relieve the Army or Navy or other governmental agencies of their responsibility for, or authority over, research and development work conducted under their legal cognizance."

The initial membership of the Executive Committee of the Research Board for National Security includes: Karl T. Compton (chairman), president of Massachusetts Institute of Technology; Roger Adams, head, Department of Chemistry, University of Illinois; A. R. Dochez, John E. Borne Professor of Experimental Medicine and Surgery, College of Physicians and Surgeons, Columbia University; Brigadier General W. A. Borden, director, New Developments Division, War Department Special Staff; Rear Admiral J. A. Furor, coordinator of

Research and Development, Navy Department. Among the other members of the Board are representatives of medical or allied sciences as follows: Major General Norman T. Kirk, Surgeon General of the Army; Major General William N. Porter, chief, Chemical Warfare Service; Vice Admiral Ross T. McIntire, chief, Bureau of Medicine and Surgery; H. S. Gasser, director, Rockefeller Institute for Medical Research; A. Baird Hastings, Hamilton Kuhn Professor of Biochemistry, Harvard University; W. S. Hunter, professor of psychology, Brown University, chief, Applied Psychology Panel, National Defense Research Committee; C. C. Lauritsen, professor of physics, California Institute of Technology; E. O. Lawrence, professor of physics, University of California; Linus Pauling, chairman, Division of Chemistry and Chemical Technology, California Institute of Technology; I. I. Rabi, professor of physics, Columbia University; and Lewis H. Weed, director, School of Medicine, Johns Hopkins University, and chairman, Division of Medical Sciences, National Research Council.

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#### WEIGHT AND CUBAGE DATA

The pamphlet, SB 8-1, Weight and Cubage Data—Medical Department Assemblages and Organizations, prepared by the Catalog Branch, Supply Service, Surgeon General's Office, and distributed by The Adjutant General, contains statistics and estimates of the ship ton, freight car, and truck requirements for all Medical Department tactical units, and similar data for certain Medical Department assemblies and major items of equipment. This pamphlet was first published in February 1944, and a second edition, made necessary by changes in organization and equipment, in November 1944. It is planned to produce a new edition when sufficient changes have accumulated to make reissue desirable. The contents are arranged according to the T/O and E numbers of the units for which information is given, and the strength of each unit is shown. All basic data required for logistical planning are contained in this pamphlet.

Additional weight and cube data are maintained by the Catalog Branch in a set of EAM card files and listings. Intended primarily for ports and depots, these listings show the weight and cube, as packed for export shipment, of all standard items stored and issued by the Medical Department. While the available weight and cube data obviously cannot be completely accurate, experience has shown that the actual weights and cubes of shipments do not vary more than 10 percent from the advance estimates and that the data prepared by the Office of The Surgeon General can be used with safety when planning movements or computing warehouse space requirements.

### DEVICE FOR ROTATORY MOVEMENTS OF THE FOREARM

The vast majority of war wounds comprise compound injuries of the extremities. Among this group is an increasing number of fractures and derangements of the upper extremity which will result in restricting rotatory movements of the forearm. In spite of the frequency of impairment of pronation and supination of the forearm, it is often underestimated or even overlooked. Much more emphasis appears to be given to extension and flexion of the elbow, one reason for which is that few physical therapy departments have a proper device for rotatory motion of the forearm. Captain Joshua Ehrlich, M. C., A.U.S., has made an inexpensive device for this purpose (figure 1).

The patient faces the device with his hand grasping the handle and with elbow bent at 90 degrees. The arm is maintained in full adduction by patient's other arm or strapped to the body in order to eliminate any other movement of the shoulder. The device consists of a plank which slides vertically between two pieces of wood and two wooden wheels of different diameter. The larger thinner wheel is fixed to the plank and is graded from 0 to 180 degrees to the left and from 0 to 180 degrees to the right of the vertical line crossing the center of this wheel. The smaller wooden wheel, which is thicker, is grooved and possesses a handle which can be turned around. Through the center of both wheels is a bolt which holds them to the plank. To the smaller wheel, a cord is fixed in such a way that when it is turned the cord is placed in the groove. The plank can be regulated in relation to the height of the patient.



FIGURE 1. Position of the forearm in extreme supination.

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**Monthly Medical Meeting.**—At the regular monthly meeting of medical officers at the Army Medical Center, Washington, D. C., 15 February, Captain Monroe Romansky, M.C., discussed "Experimental and Therapeutic Observations with Penicillin in Beeswax-Peanut Oil"; Colonel Perrin Long, M.C., discussed "Internal Medicine in the Mediterranean Theater," and Colonel Marion H. Barker, M.C., "Hepatitis in the Mediterranean Theater."



### CIRCULATING X-RAY FILM LIBRARY

A circulating x-ray film library has been developed by hospitals and dispensaries in the Second Service Command. The Library consists of x-ray films, abstracts of case histories, photographs of patients and specimens, and drawings and descriptions of "gadgets" and new techniques for making special types of roentgen examinations.

The library is inserted in three loose-leaf ring binders, each sufficient to hold about seventy-five 14 by 17 films. The albums fit into a wooden carrying case for transportation from hospital to hospital. The original collection was compiled from material contributed by the general, regional, and station hospitals and dispensaries in the command. The library is sent from station to station in the service command, each post being permitted to retain it not more than four days. On the second circuit, each hospital will remove its original exhibit and replace it with a new one. Thus the library will be renewed and kept in continuous circulation. X-ray departments are given complete freedom in choice of material for inclusion. Since the library travels on schedule, the chief of the x-ray service or section of each station knows in advance the approximate date of arrival of the albums and can plan a conference at which material from the library may be presented to the staff of his hospital.

Major Arthur B. Soule, Jr., M.C., reported that the idea was presented originally at a conference of radiologists of the Second Service Command, and it has met with enthusiastic reception. The library provides a medium of exchange of ideas between radiologists and also allows the various hospitals and dispensaries to share interesting case material. Radiologists in smaller stations have opportunity to study more unusual cases, and each radiologist can exhibit his own "pet" cases or ideas and thus increase his interest in the project.



This U. S. Army dental clinic serves not only the Paris sector, but also men of combat outfits who have priority. Here is the enlisted men's operating room. 27 November 1944.

### INSPECTING FOODS OF ANIMAL ORIGIN

The inspection and grading of food products of animal origin cannot be accomplished merely through the use of calipers, micrometers, or test tubes. Human factors enter into this work, as four of the five senses—sight, touch, taste, and smell—must be used. In grading dairy products and inspecting meat products for condition, the latter two senses are of paramount importance. They also are the most difficult properly to train and use. One can readily acquire the ability to observe the appearance and texture of a product and, with experience, place it in the proper grade denoted by these factors. The ability to detect flavors and odors differs greatly among individuals, and some cannot acquire the necessary acuteness of taste and smell to grade properly these products. All individuals, if they are to be efficient inspectors, must develop the use of these senses by practice.

Errors are frequently made by inspectors when several samples are inspected at one time, and a large percentage of these errors undoubtedly occur immediately following the examination of a sample having a pronounced flavor or odor. Experienced judges have found that pronounced flavors and odors may affect smell and taste in two ways. There may be a carry-over, so the next few samples appear to have the same organoleptic characteristics as the abnormal sample; or the olfactory nerve apparently becomes temporarily desensitized, so the next few samples appear to have no odor. This may cause the rejection of products which should be accepted or the acceptance of products which should be rejected.

Those fully experienced in judging dairy products or in the inspection of meat products for condition have found that if they are to render accurate judgment, a rest period must follow each encounter with a pronounced flavor or odor. In judging dairy products, when an abnormal sample is encountered these judges will stop, rinse the mouth with water, and frequently eat a bite of apple before resuming their judging. Likewise, in the inspection of meat products for condition, when these inspectors encounter a pronounced odor they stop the inspection work until the sense of smell is fully recovered. A bite of apple may be eaten also by these inspectors, as it helps to clear the nasal passage of carry-over odors; when they can discern the delicate flavor of the apple, the acuteness of the sense of smell has returned. Many judges and inspectors prefer to go over the entire lot of samples and eliminate those with pronounced odors prior to passing final judgment on the remaining samples.

Fewer errors will be made in the inspection of foods of animal origin if those responsible for this work will allow the senses of taste and smell fully to recover from the effect of abnormal samples before inspecting other samples.



### ARMY SCHOOL OF ROENTGENOLOGY

Since the beginning of the emergency training program in April 1941, the Army School of Roentgenology, Memphis, Tennessee, has graduated 838 officers selected from all medical branches of the Army. At the graduation on 27 January, Dr. William Calvert Chaney, president, Medical Society of the State of Tennessee, gave the principal address. The subject was "Postwar Medicine." This intensive course includes fundamentals of x-ray physics and of roentgenography and roentgen diagnosis, in addition to basic military instruction. While the course is intended to train doctors as assistant roentgenologists, to serve under experienced supervision, some of the trainees had sufficient experience to warrant assignment after graduation to handle roentgenologic problems in evacuation hospitals and even in general hospitals. A large percentage have been officers who have served overseas; several have been members of our Allied armies. The fourteenth class started the twelve-weeks course on 6 January.

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### THE NECESSITY OF MAKING DECISIONS\*

One of the necessities of military medicine is that of making decisions as to the ability of a man to return to combat duty. Far too many examples of failure on the part of the medical officer to make clear decisions have occurred. For example, many of the patients treated in base section hospitals are later returned to combat with the statement, "See your battalion surgeon and have him put you on light duty for a couple of weeks." Any medical officer must know that there are no "light duty" jobs or convalescent sections in a combat unit. If a man is fit for combat, he should be clearly told that he is going back to full combat duty and that he is quite fit for such duties. Other cases have been returned to duty with the admonition, "Try it for a time and if you can't make it, they'll evacuate you." It is impossible to imagine a more tempting offer to nurse minor residual symptoms and to magnify them until they assume disabling proportions in the mind of the soldier. If the man has minor but noninterfering residual symptoms, he should be firmly reassured about their early disappearance and firmly told that they will in no way prevent a full and effective participation in combat. When medical officers fail to fully assure the patient of his fitness, this patient is almost inevitably a noneffective shortly after his return to combat and the cause of his ineffectiveness is wholly the fault of the medical officer.

The whole problem is basically one of a failure on the part of the medical officer to be willing to make a decision. He is

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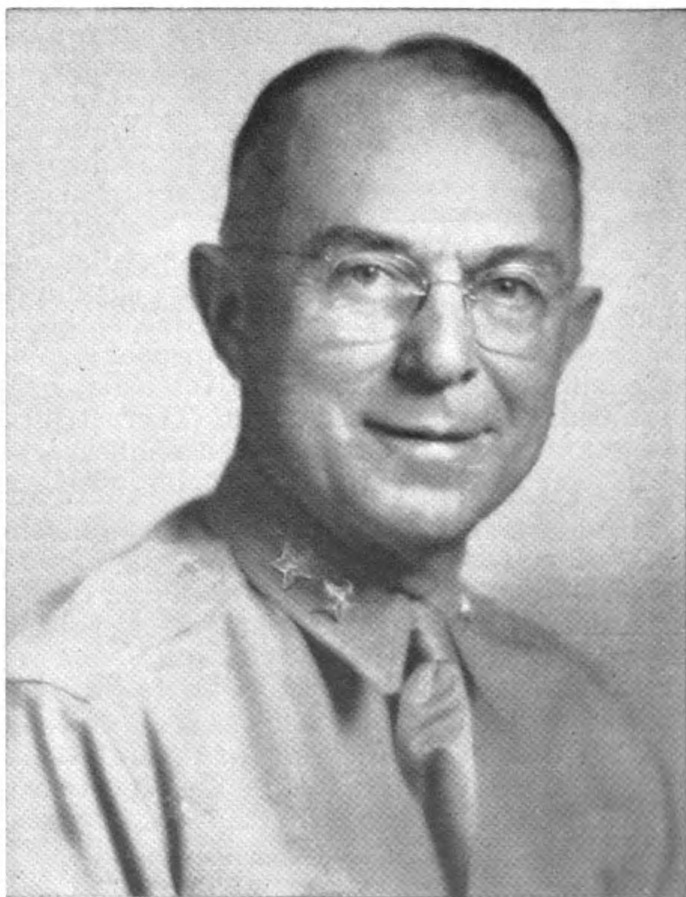
\*Editorial in the Medical Bulletin, Mediterranean Theater of Operations, January 1945, page 1.

consciously or unconsciously "passing the buck" to the battalion surgeon. The medical officer must evaluate the man and his condition in terms of "Is he ready to fight?" and then, having made up his mind on that score, the doctor must evaluate the residual symptoms. If the symptoms are transient, the patient must be told so; if they are permanent but non-interfering, the patient must have it explained that these symptoms will probably persist for a considerable time but that they will not prevent him from performing combat duty. It is absolutely essential for the future usefulness of the soldier that a definite and clear-cut decision be reached by the medical officer and that the patient then be told of this decision that "He is now considered entirely able to perform full combat duty in spite of any minor symptoms which may persist."

MORRISON C. STAYER,

Major General, U. S. Army, Surgeon.

General Stayer, a native of Pennsylvania, entered the Army medical service in 1908. He is a graduate of Lafayette College, Jefferson Medical College, Army Medical School, Army War College, and the Infantry School, Advanced Course. He was surgeon of the Caribbean Defense Command from October 1943 to February 1944; Chief Health Officer of the Panama Canal, September 1939 to February 1944; and has been chief surgeon of the North African Theater of Operations, now the Mediterranean Theater, since March 1944. Gen-



eral Stayer received the Military Order of Avacucho from the Peruvian Government in 1943 and the Distinguished Service Medal in May 1944.

### MICROSCOPIC SLIDE PROJECTIONS USING STANDARD ARMY EQUIPMENT

When pathologic material is demonstrated at Army installations, it is frequently desirable to show microscopic slides. The image produced in microprojection with a microscope lamp as light source accommodates a limited audience only. At Stark General Hospital, histologic slides have been demonstrated as follows to more than seventy-five persons, using standard Army equipment, Captains Nathan Steinberg, Daniel L. Jones, and Hans Popper report. The projection is comparable to that of elaborate commercial microscope projection devices. The method has been used for several months at weekly clinical-pathologic conferences or at demonstrations of surgical and autopsy material.

A monocular microscope with the ocular lens removed is used. A delineascope or balopticon lantern slide projector

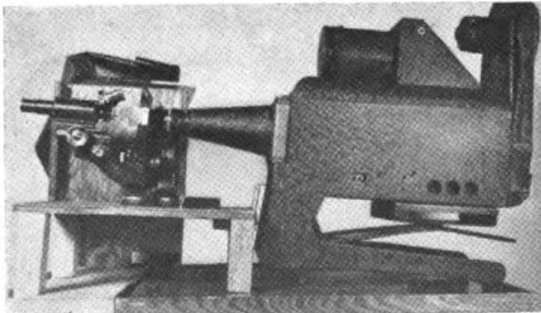


FIGURE 1. Delineascope and microscope in optical alignment, with hood removed.

serves as light source (Signal Corps equipment, catalog No. 8A3122.1). The end of the conical frontpiece is placed snugly against the substage condenser of the microscope. The inclination joint will then be broken to an angle of almost 90 degrees, and the draw tube of the microscope should be a direct continuation of the long axis of the delineascope. This optical alignment is of prime importance for proper projection. Any deviation results in reduction of light intensity, unequal illumination, and appearance of colored rings. There is little difficulty from light loss at the junction between delineascope and microscope, and this can be eliminated by covering with a hood (figure 1).

If only a single unit substage condenser is available, it is left in place for the 10X or 44X objectives but is removed for the 3.5X objective. The removal of the condenser is somewhat time-consuming and the alignment of the microscope with the delineascope must be renewed each time; therefore, a condenser with a detachable top half is preferred since the bottom half can be left in place for all magnifications. If the 3.5X objective cannot be lowered far enough to focus the image, it is recommended that a longer 3.5X objective be used or that the slide be raised higher on the stage by means of a metal or wooden frame. If the microscope is placed 20 feet from the screen, the picture has a diameter of 3½ feet and is sufficiently lighted to show fine detail, even with the 44X objective, and can be seen clearly by more than one hundred people.

### CARBON TETRACHLORIDE POISONING

Information received from the Mediterranean Theater of Operations indicates that the attention of medical officers should be directed to the dangers and varied clinical features of carbon tetrachloride poisoning. Ready availability and common use of this compound as a cleaning agent for ordnance and clothing offer many opportunities for inhalation, especially when employed in a closed room. The work of examining and refilling fire extinguishers is another hazard. Clinical poisoning has resulted from leaks in fire extinguishers inside closed military vehicles. If stored in unlabeled containers, carbon tetrachloride may be ingested by mistake.

Clinical manifestations may be those of dysfunction of the brain, gastro-intestinal tract, liver, or kidneys, and the severity of attacks varies widely. Carbon tetrachloride intoxication may bear a striking resemblance to alcoholic intoxication with headache, vertigo, mental confusion, and coma. Anorexia, nausea, vomiting, abdominal cramps, and diarrhea constitute the gastro-intestinal symptoms. Carbon tetrachloride, particularly when ingested, may cause liver injury, and failure may develop with extreme rapidity, manifesting jaundice and widespread hemorrhages. Subconjunctival hemorrhages appear early. Hemorrhages into the skin, and from the mouth, rectum, and urinary tract are common in severe poisoning. Renal injury, which is particularly likely to occur from inhalation, is manifested by oliguria, hyposthenuria, and sometimes anuria. Azotemia may be extreme although urea nitrogen concentration is normal or only slightly increased. The presence of hypertension in a jaundiced patient should suggest carbon tetrachloride as the etiological agent. A spectacular clinical manifestation of carbon tetrachloride poisoning is convulsive seizure which may occur in an individual who is entirely lucid immediately before and after the seizure. The most important principle of diagnosis is to suspect the condition and to make adequate inquiry into the possibility that the patient has either been exposed to the fumes or has ingested the liquid.

Effective treatment requires early diagnosis. The administration of fluids and glucose was discussed in the March issue of *The Bulletin*, page 40. Whole blood transfusions and large doses of vitamin K should be used if hemorrhagic phenomena are present. The diet should be high in protein and carbohydrate and low in fat. Skimmed milk powder, 200 grams a day, serves as a good source of protein and essential amino acids. If the patient can be kept alive a few days, complete recovery from severe renal and hepatic damage may be expected.

### CORRECTION

**Effect of Malaria on Serologic Tests for Syphilis.**—In the article by this title in the January 1945 *Bulletin*, page 77, table I, last line, under columns headed "Eagle" and "Hinton," the author writes that the figures should be 10 and 17, respectively.



### SCHISTOSOMIASIS JAPONICA IN LEYTE

Of the limited number of foci of schistosomiasis japonica in the Philippine Islands, one is on the island of Leyte. During the early stages of military operations on this island, exposure to the disease by some of the troops engaged was inevitable. Preliminary reports indicate that the diagnosis of schistosomiasis japonica has been proved in a number of cases by the demonstration of eggs in the stools, and in some of the cases characteristic early symptoms, especially urticaria and eosinophilia, were present. It is urgent to bear in mind the possibility of infection in military personnel in endemic areas. It is important that the diagnosis be made at the earliest possible time in order to institute treatment without delay, as the sooner treatment is begun after infection occurs the greater is the chance of cure. Patients in the United States who have, or are suspected of having, schistosomiasis should be transferred through the medical regulating officer to the Moore General Hospital, Swannanoa, North Carolina. A more detailed account of recent experience with this disease will be published in an early issue of *The Bulletin*.

### SHIPPING CONTAINER FOR VACCINES AND PENICILLIN

Information has reached The Surgeon General's Office that the quartermaster food container with three inserts is being used in the shipment of vaccines and penicillin where extremely high temperatures prevail within the theater during shipment. Experiments have shown that ice will last in this type container well over thirty-six hours which is sufficient time to ship vaccines or serums by air to any point within any theater. The middle insert is used for packing the vaccine or serum. The other two inserts are removed to allow sufficient space for packing ice. The container is conspicuously marked



in red to indicate the contents. A record of the icings is also conspicuously affixed to the cover of the container. It is believed that this adaptation of the insulated food container for shipment of serums and vaccines which do not require a continuous frozen state will give very satisfactory results.

Signal Corps photograph

### MANAGEMENT OF RELAPSING VIVAX MALARIA

Some individuals with *vivax* malaria have relapses in spite of any available form of treatment. When treatment is instituted promptly, all manifestations of the disease are quickly brought under control. In such circumstances, *vivax* relapses cause only brief incapacitation and do little or no discernible damage to the individual. The potential cumulative effect of relapses, however, is clearly undesirable. Furthermore, the occurrence of relapses, even though brief, interferes with military duty or with leave or furlough.

Reliable statistics of the incidence of relapses throughout the course of an infection with *vivax* malaria are not available; however, relapses do not continue to occur indefinitely, provided reinfection is excluded. It is fairly well established for South Pacific strains that, in the absence of suppressive medication 50 to 60 percent of patients having a relapse will have another within a period of observation such as six months. This percentage is not greatly increased by observation for another six months. At the rate of 60 percent, of 1,000 men having a primary attack of *vivax* malaria, about 130 have five relapses only, 10 have ten relapses, and 1 has fifteen relapses. Unfortunately, it is quite impossible at present to foretell which individuals with *vivax* malaria will have relapses. It is of practical significance however, that about 80 percent of the relapses observed during twelve months' observation occur in the first three months.

Relapses can be avoided by means of suppressive medication, provided the drug used is taken in adequate amount and with unflinching regularity. Available evidence indicates that not more than 2 to 5 percent of individuals infected with *vivax* malaria have attacks while faithfully taking atabrine, 0.1 gm. a day. At least 10 grains of quinine a day are required to achieve the same result in the case of South Pacific strains. In areas in which suppressive medication is in general use and its administration is efficient, attack rates of large bodies of troops known to be heavily seeded with *vivax* malaria are remarkably low. On the other hand, in areas like the United States where suppressive medication is not in general use, relapses of malaria acquired overseas are troublesome.

A liberal use of suppressive medication should be made in individuals known to have *vivax* malaria unless they have passed through a period of three months without a relapse while not taking suppressive medication. In general, it is desirable to follow clinical treatment for an acute attack immediately with suppressive treatment for three months. Atabrine is the drug of choice. One tablet (0.1 gm.) a day is the proper dosage. In cases in which, for substantial reasons, atabrine is considered undesirable, quinine sulfate, two tablets (0.6 gm.) a day, may be used. Clear instructions and appropriate advice should be given to patients before disposition. Patients should be returned to duty as soon as they are fit, without regard to the institution of

suppressive medication. Their commanding officers should be notified of the need for continuation of suppressive medication. It is recognized that administrative arrangements cannot be made which will ensure regularity in the taking of suppressive medication by individuals in a duty status; nevertheless, it is believed that a substantial reduction can be effected in the incidence of relapses.

Suppressive medication is useful in individuals known to have *vivax* malaria in various other circumstances. An outstanding example is in connection with surgical operations. In general, it is desirable to institute atabrine suppression preoperatively in individuals who have had an attack of *vivax* malaria within six months. In such instances, if atabrine is used and no atabrine has been taken within three weeks, "loading doses" of 0.1 gm. ( $1\frac{1}{2}$  grains) three times a day for three days should be given at the start. It should be borne in mind that suppressive medication is not given with the hope of effecting a cure of *vivax* malaria and that some individuals eventually will have relapses after it is discontinued.

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#### CONCENTRATION OF ATABRINE IN PLASMA IN TREATMENT OF VIVAX MALARIA\*

The concentration of atabrine in plasma was determined, using the method of Brodie and Udenfriend,<sup>1</sup> on 6,733 specimens from patients during and after treatment for 412 attacks of malaria at Harmon General Hospital. With this method, atabrine is determined by measuring its fluorescence in an acid medium. The intensity of the fluorescence produced by ultraviolet light of the proper wave length is compared with that produced by a known amount of atabrine. The average recovery was 96 percent when known amounts of atabrine as small as 0.25 microgram were added to 5 or 10 cc. of plasma. Patients in this study all received atabrine dihydrochloride dihydrate. The values obtained for concentration in the plasma of patients undergoing treatment are probably slightly higher than actual concentration because of the inclusion of small amounts of fluorescing degradation products of atabrine.

The standard treatment was the oral administration of 2.8 gm. of atabrine in about seven days. In thirty-three of the patients, however, the amount was 3.2 gm. The range of the daily average fasting values on the standard 2.8 gm. treatment from the second through the eighth days was 41 to 52 micrograms per liter, while the concentrations of specimens taken 4 hours after the first daily dose of drug were 49 to 57 micro-

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\*Abstract of a paper by Captain Lester D. Ellerbrook, Sn.C.; Lieut. Colonel Stuart W. Lippincott, M.C.; Second Lieut. Carlo F. Cateno, Sn.C.; Major Harry H. Gordon, M.C.; and Colonel Alexander Marble, M.C., submitted through The Surgeon General's Office to the Journal of Clinical Investigation.

1. Brodie, Bernard B., and Udenfriend, Sidney: The Estimation of Atabrine in Biological Fluids and Tissues, The Journal of Biological Chemistry, vol. 151, No. 1, November 1943.

grams per liter. The average plasma concentrations at 2 and 4 hours after the administration of 0.1 gm. atabrine with each meal varied from 2.3 to 12.0 and 6.8 to 11.3 micrograms per liter above the corresponding fasting levels. After the administration of the drug was discontinued, the levels decreased slowly, so that by four weeks after beginning treatment the average fasting concentration was 8 micrograms per liter. Individual curves frequently differed from the average pattern. During the period of suppressive treatment (0.1 gm. six days a week, following standard treatment) in patients followed through the sixtieth day from the start of treatment (2.8 gm.), the levels dropped slowly to an average concentration of 23 micrograms per liter.

The range of the daily average fasting atabrine concentrations on the 3.2 gm. treatment from the second through the eighth day was from 36 to 63 micrograms per liter. When treatment was discontinued, the levels fell slowly, so that by the eighteenth day after treatment was started the average concentration was about that attained by the standard 2.8 gm. group (15 micrograms per liter).

When a fasting plasma atabrine concentration of about 45 micrograms per liter was attained within 24 hours and maintained, the symptoms of attacks were abolished in practically all cases within 72 to 96 hours after the start of treatment. Regardless of the plasma level, 90 percent of the blood smears in 234 attacks were negative within 32 to 48 hours of the initiation of treatment and 66 percent of the patients in 313 attacks had a normal temperature on the second day after the initiation of treatment.



A native adjusts valves on drip-oiler on stagnant stream on Efate, New Hebrides. The three oil drums welded together hold 150 gallons. The shore line has been cleared of vegetation to permit complete coverage of water by oil. 21 August 1944. Signal Corps photograph.

### REFRESHER COURSES FOR MEDICAL OFFICERS

Refresher professional training has been authorized for Medical Corps officers who are to be assigned to professional duty and who, because of assignment to command, administrative, or semiprofessional positions, have not been engaged in the professional aspects of medical service during the last twelve months or more. The training will be voluntary, and priority for such training will be given to officers who have served overseas, although it will not be limited necessarily to this group. This refresher training will be given in selected A.S.F. general hospitals and requests for this training will be submitted through channels to The Surgeon General who will make assignments to the hospitals. This training is not an A.S.F. school course and requests for attendance will not be included in requests for A.S.F. school quotas. Every Medical Corps officer of the Army Service Forces returning from overseas assignment will be apprised at reception stations of the opportunity to request assignment to this in-service professional refresher training and will be required to state whether or not he wishes to take the refresher training.

Officers selected for this training will be ordered on temporary duty for a period of not more than twelve weeks. Per diem is authorized in accordance with the provisions of War Department Circular No. 260, 26 June 1944, as amended by section I, War Department Circular No. 433, 8 November 1944.

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### SPINAL CORD INJURIES

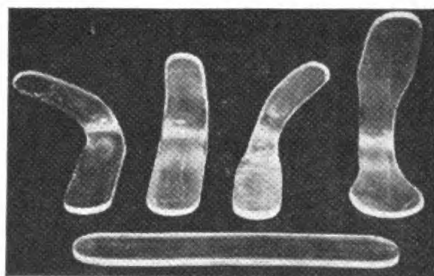
The following remarks have been extracted from a recent overseas report prepared by Colonel R. G. Spurling:

The cases are divided into two main categories—those with and without complete physiological loss of function. This division is apt to be arbitrary inasmuch as no two observers might be willing to agree on what is "complete physiological loss." The fact that only 62.5 percent of this large series were classified as complete is therefore not of particular significance. It has been the policy of this theater to explore all gunshot wounds of the spinal cord in which there is the slightest doubt of complete anatomical disruption of the spinal cord. The reasons for so doing are many, but the unanswerable one seems to be that it is the humane thing to do even though the results of operation are so often disappointing. After all, it gives the patients and their families a prognosis. Only 41.5 percent of the cases were operated on and of this group only 9.4 percent showed prompt improvement in symptoms following the operation. However, there were isolated instances of dramatic improvement following operation and these few gratifying cases would seem to justify the retention of the policy. The incidence of infection of the wound following surgery was small and as a rule was not of serious consequence. Mortality statistics on the first group were not obtained, but in the second group of 457 cases only 5 percent died from one cause or another while under observation in the hospital.



### CHEEK RETRACTORS

During oral surgical procedures, a cheek retractor often is of value, and while not provided for in the Medical Supply Catalog, one can be constructed from scrap Plexiglas found at any Air Forces supply salvage area. Major Bernard A. Rakow, D.C., reports that the Plexiglas should be selected on the basis of width desired and cut to size and shape with a ribbon saw or metal disk. The usual buffing and polishing agents will provide a smooth finish. To mold it, heat, gently and uniformly to avoid fracturing, the area which is to be bent, and hold in position until cool, and then quench in cold water. Cold sterilization will prepare it for use. Other retractors, plaster spatulas, and tongue depressors can be made from this waste material. Some types of Plexiglas will swell on heating; it would be wise, therefore, to test before using.



### OCULAR CHANGES IN SCRUB TYPHUS\*

Careful ocular study made of sixty-four patients suffering from scrub typhus was reported by Major Harold G. Scheie, chief, E. E. N. and T. Clinic, 20th General Hospital. In addition to regular weekly external and ophthalmoscopic examinations done under mydriasis, visual acuity and visual fields were recorded for many of the cases. Among the sixty-four patients, hyperemia of the conjunctiva was present in 51.5 percent. Two patients had bulbar subconjunctival hemorrhages. One patient developed an unusual type of nystagmus when attempting to fix his eyes on objects. Ophthalmoscopically, the earliest and most common abnormality was engorgement of the retinal veins, occurring in about 76.5 percent of the patients. The veins became irregular and hazy in outline and appeared compressed or even interrupted at the arteriovenous crossings. As these changes in the veins became marked, edema of the disc and retina appeared during the second and third week of the disease in 42.3 percent of the cases. Retinal hemorrhages, usually flame-shaped, occurred in 10.9 percent of the cases and "cotton wool" exudates in 4.7 percent of the cases. The entire picture suggests vascular injury as the probable cause. No evidence of perivascular infiltration could be seen ophthalmoscopically, though this is regarded as the underlying pathologic change in the disease. Papilledema was considered ruled out because of the nature of the retinopathy and absence of

\*Abstract of paper submitted through The Surgeon General's Office to the Archives of Ophthalmology.

enlargement of the blind spot. Optic neuritis likewise was excluded by the presence of normal visual acuity and the absence of the central scotoma.

The retinopathy continues as a rule for some time after the other physical findings of the disease have disappeared. Since this is the case, serial ophthalmoscopic examination is of value in following scrub typhus patients through convalescence. Normal eyegrounds have been used during this study as one of the requirements for return to duty status. In areas where scrub typhus is endemic, ophthalmoscopic examination is important in the diagnosis of fevers of unknown origin, for the retinal picture may be extremely helpful. Patients having malaria, typhoid, or dysentery show no comparable retinal changes.

#### ARMY ADOPTS NEW RODENTICIDES

The Surgeon General's Office has cooperated with the Office of The Quartermaster General in standardizing new rodent control supplies and equipment. Barium carbonate (rat bait), which has been used by the Army, has not been found highly effective for all rodents.

Army Service Forces Catalog QM 4, January 1945 (page 53) lists the following: (1) Rodenticide, general control. This rodenticide is zinc phosphide. It is effective against all types of rodents. The toxicity is high and a low percentage (1 percent) of poison can be used in the baits. When properly packaged and stored, its toxicity is retained over long periods of time. It is not expensive compared to other poisons of equal toxicity. When properly used and distributed, it is not dangerous to persons, although it must be kept out of reach of children and domestic animals. Its characteristic garlic odor acts as a repellent to humans who may accidentally come in contact with the poisoned bait. (2) Rodenticide, plague control. This rodenticide is thallium sulfate and in some instances is more effective than zinc phosphide. However, thallium sulfate is scarce and therefore will be used only in case of a rodent disease outbreak and on approval of The Surgeon General. (3) Rodenticide, fumigant dust. This rodenticide was previously known as calcium cyanide, dust A. Rodenticide fumigant dust is for use in gassing rodents in their burrows. It should never be used indoors. (4) Pump, foot, rodenticide fumigant. This foot pump has been standardized so that the above fumigant dust may be distributed throughout the rodent burrows.

The Sanitary Engineering Division of The Surgeon General's Office is now preparing War Department Technical Bulletin TB MED 144, Rodent Control, which gives rodent survey and control methods, poison formulas, first-aid directions, plague control methods, and a number of references on rodent control. This Technical Bulletin should be issued about 1 April 1945.

### PREVENTION OF CORROSION OF INSTRUMENTS AND EQUIPMENT

Since early in 1943, an increasing number of surgical, dental, and laboratory items of equipment have been protected against corrosion by a method which is believed entirely unique. Normal corrosion prevention is obtained through mechanical exclusion of moisture from metallic surfaces by specially prepared greases or oils containing high percentages of polar compounds. The results of such methods have been eminently satisfactory, but such polar-type greases leave a thin film on metallic surfaces which is not readily removable without special solvents, and which for other reasons, also, seem undesirable.

The method developed by the Medical Department is based on the prevention of oxidation even in the presence of moisture and requires no protective film adhering to metallic surfaces. Working from the postulate that corrosion is essentially the product of the ionization of water in contact with metal surfaces, Medical Department chemists verified the galvanic nature of corrosion and elaborated a system to counteract the normal galvanic flow of negatively charged ions in the presence of a single metallic surface. Basically, the system involves overwrapping instruments with a metal foil which is electropositive to the alloy or metal from which the instrument is made. Aluminum foil was selected as the most desirable overwrap from a physical and chemical standpoint. Oxygen or other negatively charged solute ions migrate to the aluminum foil wrap, which, being in contact with the instrument, forms the anticathode in a simple electric cell which operates until all moisture present is completely decomposed. This cell is effective until the surface of the aluminum is completely oxidized. To prevent too rapid oxidation of the aluminum, the entire foil-wrapped instrument is placed in a laminated, foil-lined, heat-sealed bag, whose moisture-vapor transmission rate is 0.05 gm. of moisture vapor, per 100 square inches per twenty-four hours. It is estimated that this pack will withstand at least six months and probably a year of complete submersion and will furnish protection against normal exposure for more than ten years.

Continuing study of Medical Department instruments has permitted the use of this type of protection on an ever-increasing number of items to the extent that laryngoscopes, otoscopes, and similar items are now receiving protection by this method. Obviously, aluminum instruments and instruments fabricated from metals or alloys which stand in the electric-motive series, electropositive to aluminum, cannot be overwrapped in aluminum foil. Nor has a physical technique been evolved for proper overwrapping of extremely large or complicated mechanisms. However, research on extending the application of aluminum foil is continuing with gratifying re-



sults. Protection for x-ray, fluoroscopic, and other delicate electrical equipment has been and is being elaborated in conjunction with Signal Corps research, with a view to obtaining the highest degree of protection against normal exposure and against molds. The use of metacresol acetate for the prevention of fungus growth in the lenses of optical systems is being investigated (*The Bulletin*, March 1945, page 26), and ceaseless effort is being made to perfect specialized packing methods.

#### CASUALTIES FROM OVERSEAS

The rate of evacuation of casualties from overseas to the United States as of 5 February was more than 30,000 each month as compared to about 9,000 per month during the first



Casualties aboard a lighter at Munda Point, New Georgia.

half of 1944. Plans were then near completion to increase the capacity of the Army general and convalescent hospital system by 70,000 beds. One means for providing additional facilities was the temporary conversion of four station hospitals to the general and convalescent type of hospital. These are at Camp Edwards, Falmouth, Mass.; Camp Pickett, Blackstone, Va.; Camp Butner, Durham, N. C.; and Camp Carson,

Colorado Springs, Colo. Another feature of the program will be the expansion of convalescent hospitals at Camp Upton, Yaphank, Long Island; Fort Story, Virginia Beach, Va.; Daytona Beach, Fla.; Campo, Calif.; Avon, Conn.; Wakeman General and Convalescent Hospital, Camp Atterbury, Ind.; and Percy Jones General and Convalescent Hospital, Battle Creek, Mich.

### AWARD OF THE SOLDIER'S MEDAL

The War Department has announced the award of the Soldier's Medal to the following Medical Department personnel.

**CAPTAIN CHARLES B. SKINNER, M. C., posthumous:** During a training demonstration 23 March 1944, a soldier fell into the torrent of an icy mountain river in Blackwater Canyon near Davis, West Virginia. Captain Skinner, with utter disregard for his own safety, lost his life in attempting to rescue the soldier from the turbulent waters.

**CAPTAIN WILLARD E. GOODWIN, M.C., of Baltimore, Maryland:** He rescued an Army nurse from a rough sea, after she had been swept into a gorge, on 27 February 1944, in New Zealand. He went to the aid of the nurse, who, dragged against the rocks, had suffered painful injuries. He assisted her to a beach some 400 yards away and by his prompt action saved her life.

**CAPTAIN GEORGE R. CONNOR, M.C., of Kirksville, Missouri:** When a plane crashed on 14 June 1944 in the Far East, he and an ambulance driver proceeded to the scene. The aircraft burned rapidly, creating imminent danger of gasoline or bomb-load explosions. He ascertained that the pilot was not in the forward cockpit, while the ambulance driver searched the rear section for the gunner. With ammunition exploding, they also searched the area until the crew members were located some 200 yards away. They administered to the injured fliers, who were then removed to a hospital. Their complete disregard for personal safety reflects great credit on themselves and the military service.

**SERGEANT CHARLES F. BEITTEL, of Mitchell, South Dakota, and SERGEANT LONNIE A. BOTHE, of Brenham, Texas:** Near Camp Gruber, Oklahoma, on 19 June 1944, a 2½-ton Army truck left the road on a hill and turned upside down, pinning five enlisted men beneath it. The truck was insecurely resting on gravel, and there was danger that it would slip and crush the men under it. There was added danger of fire or fumes from the gasoline-saturated ground. With utter disregard for their own safety and at the risk of their lives, they crawled under the truck and removed the dead and injured men from under the wrecked vehicle.

**TECHNICIAN FOURTH GRADE JOHN C. VENTURINO, of Brooklyn, New York:** Two soldiers had gone to the rescue of a woman in danger of drowning in the swift tide and deep water of the beach of Staten Island Area Station Hospital, Staten Island, New York, on 17 July 1944. They were nearly exhausted by their exertions and experienced great difficulty in keeping her afloat. He swam through the treacherous waters and towed the unconscious woman to shore.

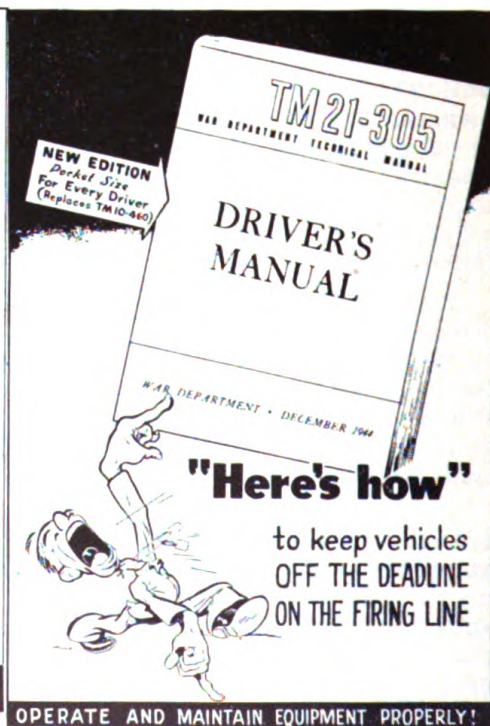
**CORPORAL WALTER F. HEBDA, TECHNICIAN FIFTH GRADE JAMES J. BRETZ, TECHNICIAN FIFTH GRADE CLARENCE G. UNHOCK, and PRIVATE FIRST CLASS RODNEY MAGIERNA, all of Chicago, Illinois:** On seeing an Army plane crash and burst into flames at Doboduru, New Guinea, 21 February 1944, they ran to the scene. With no regard for their own safety and despite flames, exploding machine-gun ammunition, and imminent danger of exploding gasoline, they assisted in removing the pilot, who was unable to extricate himself. This heroic act aided in saving the pilot at the peril of their own lives.

**PRIVATE FIRST CLASS JAMES S. MOORE, of East Orange, New Jersey:** A woman swimming off the beach of Staten Island Area Station Hospital, Staten Island, New York, on 17 July 1944, was caught in the ebb tide in deep water and was being swept farther from the shore. He swam to her rescue, and with the aid of another soldier, brought her safely to the beach.





Fifth Army mules wounded at the front in Italy being taken to a veterinary hospital in the rear. Signal Corps photograph.



(Left) Handling tools correctly is essential to any maintenance service and to the conservation of the tools themselves. (Right) Faithful use of the new *Driver's Manual* will reduce vehicle deadlining. Posters prepared by Maintenance Division, Army Service Forces, as part of Army Conservation Program for February, and distributed to all Army motor pools and shops.

## NEW TRAINING FILMS

The Surgeon General's Office has released several new training films, film bulletins, posters, and film strips.

*Ward Care of Psychotic Patients (TF 8-2090)*. This film, for the enlisted medical technician, presents proper nursing care of psychotic patients. It deals with the technique of restraining the patient as well as the technique of giving sedative baths and packs. Precautionary measures to be observed are shown. (Distribution: Service command central libraries, medical ASFTCs, medical enlisted technicians' schools, and hospital psychiatric centers)

*Evacuation Hospital (FB 173)*. Edited from film taken in European Theater of Operations. The story of an evacuation hospital in a theater of operations. The site for locating the hospital, erection of tents, installation of utilities, arrival of patients, professional procedures, discharge of patients, sanitary precautions, and other administrative matters are portrayed. (Distribution: Service command Signal Corps libraries, medical ASFTCs, and headquarters, theaters of operations)

*Blood Bank in NATOUSA (FB 176)*. The blood bank is shown from the time the donor (here all donors were Army personnel) is selected, through the precautionary laboratory tests, storage, and shipment by air, ship, and truck, until administration to a casualty. Laboratory procedures are illustrated in detail. (Distribution: Service command Signal Corps libraries and headquarters, theaters of operations)

*Trench Foot (FB 180)* is intended for use in training all personnel in methods of avoiding trench foot. It shows the dangers and end results of trench foot, as well as the usual neglect of the feet which leads to the development of the condition. It also shows how trench foot may be avoided even under the most adverse circumstances. (Distribution: Service command Signal Corps libraries and medical ASFTCs)

*Strictly Personal (TF 8-2093)*. This film for the W.A.C. is on personal hygiene. The following subjects are illustrated: nutrition, weight, reduction, exercise, posture, constipation, feminine hygiene, personal cleanliness, and general grooming. The picture shows how observance of proper health measures produces efficiency and pride in Corps. (Distribution: Signal Corps service command central and sub-libraries, W.A.C. training centers, headquarters, theaters of operations, and A.A.F. film libraries)

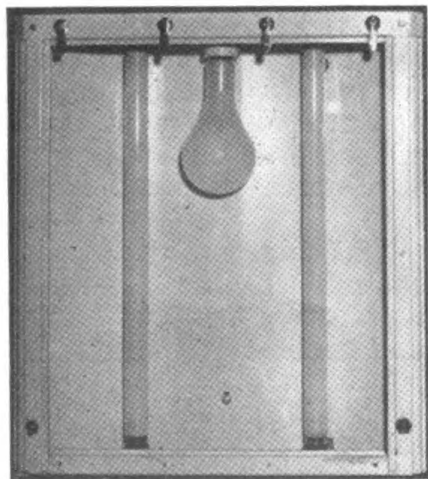
There are ten new Medical Department posters, all in the realm of sanitation and Army hygiene. These GTAs, or graphic training aids, distributed through A.G.O., are: 8-7, "It's an Old American Custom—Keep Clean (Bathing)"; 8-8, "After (Wash hands after latrine)"; 8-9, "Before (Wash hands before eating)"; 8-10, "Don't Let Lice Make a Monkey of You"; 8-11, "Typhus Is Spread by Lice"; 8-12, "When a Fly Wipes His Feet on Your Food" (mess sanitation); 8-13, "Don't Be Your Own

Doctor"; 8-14, "Cover Coughs, Cover Sneezes"; 8-15, "Beware, Drink Only Approved Water"; 8-16, "This is Trench Foot" (foot hygiene).

There are also two new film strips. The first, *SFS 8-96, WAC Physical Fitness Rating*, with excellent sound recording, deals with the four basic exercises by which physical fitness ratings (PFR) are measured and how they are scored. The other, *FS 8-98, Sterile Technique*, aims to train surgical technicians in operating room procedures. Methods of sterilizing skin, autoclaving instruments and supplies, and "scrubbing up" for an operation are illustrated. (Distribution: Service command Signal Corps film libraries, headquarters, theaters of operations)

#### VIEWING BOX FOR USE WITH OVEREXPOSED FILMS

In most x-ray departments it has been customary for the radiologist to have an electric light bulb to provide an intense source of light for use in viewing overexposed films or for visualization of soft-tissue structures that are "burnt out" by overexposure. The additional electric light bulb is most commonly attached to an ordinary lamp from which the shade has been removed. The bulb is either on a fixed base or an extension cord. To obviate having to reach for the additional source of light or to take the overexposed films to the intense light,



Major H. H. Lerner, M.C., and Leland A. Trumbo have modified the usual fluorescent viewing box by the installation of an electric light socket and bulb. This simple modification can be made with fixtures usually available in any Army installation. The light bulb socket is attached to the under side of the top of the viewing box, and an additional switch similar to that which is present on the viewing box is installed on the opposite side of the viewing box. When the films are being viewed and an overexposed film is to be

read, the second switch can be flicked on and an additional intense source of light brought into play, permitting visualization of the structures that were overexposed. The additional source of light also comes in handy in cases of lateral views of the lumbodorsal spine where the lower dorsal vertebrae are usually overexposed, skull plates where soft-tissue swelling sometimes gives the radiologist a lead in searching for infection of the bones, and intentionally overexposed Bucky films of the chest when fluid is present.



### SHIPMENT OF WHOLE BLOOD TO PACIFIC THEATERS OF OPERATIONS

The program for shipping whole blood to Pacific theaters of operations was inaugurated on 15 November 1944, at the joint request of the Surgeons General of the Army and Navy. The original request called for the establishment of facilities in the San Francisco, Oakland, and Los Angeles centers to procure a minimum of 300 pints of type "O" whole blood a day, with the understanding that the program would be regulated to meet varying Army-Navy needs.

In contrast to the European Whole Blood Project, in which the Army has over-all jurisdiction and ships the blood to Europe by the Air Transport Command, the Pacific Whole Blood Program is under the jurisdiction of the Navy with the Naval Air Transport Service flying the blood to Guam for re-icing and distribution to Army and Navy installations.

All technicians in the Red Cross blood donor centers are furnished by the Navy, excepting those in the Los Angeles Center, who are detailed by the Army. The blood is shipped in expendable wet ice refrigerated containers holding sixteen bottles, each containing 480 cc. of whole blood plus 120 cc. ACD solution as a preservative.

The program was inaugurated in San Francisco and Oakland on 15 November and in Los Angeles on 21 November 1944. Between these dates and 13 January 1945 a total of 17,077 pints of whole blood was procured and shipped overseas. The highest weekly shipment was 3,848 pints, the average weekly shipment 1,897 pints. Other centers are being readied at San Diego, California, and Portland, Oregon, to provide facilities for procuring up to 650 pints of blood per day. Unlike the European Whole Blood Program, where 1,000 pints of whole blood a day have been requested, the Pacific quota varies weekly according to requests received from the theater.

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From Surgical Consultants Division, Surgeon General's Office.

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**Army Medical Museum Seminars.**—Dr. Frederick J. Brady, of the National Institute of Health, who recently returned from a mission to Mexico and Guatemala, discussed "Onchocerciasis" at the Army Medical Museum seminar, Washington, D. C., 20 January. Dr. Murray J. Shear, of the National Cancer Institute, discussed "Cancerogenesis" at the seminar on 27 January. On 10 February Dr. Fred W. Stewart, acting director, Memorial Hospital for Treatment of Cancer and Allied Diseases, New York, discussed "Cancer and Single Injury." Dr. Wiley D. Forbus, professor of pathology, Duke University School of Medicine, current resident consultant, Army Institute of Pathology, discussed "Granulomatous Disease in Swine with Striking Resemblance to Hodgkin's Disease." on 17 February.



### RECONDITIONING ON HOSPITAL SHIPS

The activities of interested branches of the Army and the American Red Cross in providing a planned program on hospital ships of recreation, reconditioning, and religious and social service are defined and procedures established for securing supplies and equipment for such program, in Part Two, ASF Circular No. 36, dated 31 January 1945. The reconditioning program contemplated will include a suggested minimum of four hours a day, providing (1) daily news summary; (2) educational activities diversional in nature; and (3) orientation and information discussed in short units, such as relief of anxiety concerning destination, demonstration by map of the locations of general hospitals in the zone of the interior, the policies of Army hospitals, relief of concern for family, benefits available to the family, further medical treatment, prospects of returning to duty, job problems, veteran legislation, and benefits available to soldiers. The fullest possible use should be made of "G.I." movies, feature films, and short subjects; music should be a part of the program; books and current magazines of good subject matter will be circulated freely; athletics and light sports for ambulatory and troop class patients, when space is available, and voluntary hobby and craft programs should be encouraged. The circular outlines programs of physical and educational reconditioning suggested for hospital ships.



Officers listening to directions for their exercise program for the day in the Army's rehabilitation program at a station hospital in England. 31 August 1944.

### AWARD OF THE STRONG MEDAL

At the annual meeting of the American Foundation for Tropical Medicine, the first Richard Pearson Strong Medal was awarded to Colonel Richard P. Strong for distinguished service in the field of tropical medicine. The medal is cast in palladium, a rare, white metal more precious than gold. Some highlights in Colonel Strong's career have been his appointment in 1899 as president of the first Board for the Investigation of Tropical Diseases in the Philippine Islands; leader of a scientific expedition to tropical Africa, the Amazon valley, Central America, and the valleys of the Andes; leader of relief expeditions to the peoples of Manchuria stricken by an epidemic of pneumonic plague and to Serbia during the typhus fever epidemic in 1915; professor of tropical medicine at Harvard University; past president of the American Society of Tropical Medicine; member of the Inter-Allied Sanitary Commission in the first World War; consultant in tropical medicine to the Secretary of War; director of the course in tropical medicine at the Army Medical School; and recipient of the Distinguished Service Medal in 1919 for services, notably as president of the Board for the Investigation of Trench Fever.

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### SOCIAL HYGIENE AWARD

Major General Merritte W. Ireland, U. S. Army, retired, received on 7 February the William Freeman Snow Award of the American Social Hygiene Association for Distinguished Service to Humanity, in recognition of his service to progress in social hygiene. In announcing the award, General of the Armies John J. Pershing, chairman of the Committee on Awards, in a letter to the president of the Association, pointed out that General Ireland's career began in 1891 as an Army medical officer and culminated in thirteen years' service as Surgeon General, a post to which General Pershing recommended him in 1918. He accompanied the American Expeditionary Force to France in 1917, serving for a year as Chief Surgeon, and receiving special commendation for keeping manpower and morale at a high peak of efficiency, particularly through prevention of venereal disease.

General Ireland has previously received the Distinguished Service Medal and decorations from Great Britain, France, Serbia, and Poland. He is secretary of the Gorgas Memorial Institute of Tropical Medicine, president of the Army Mutual Aid Association, member of the board of directors of the American Social Hygiene Association and of its Committee on War Activities, and was for many years a member of the Council on Medical Education and Hospitals of the American Medical Association.

## RECENT DIRECTIVES AND PUBLICATIONS

This list is intended as only a brief reference to the items mentioned. Before acting on any of them, the original communication should be read, and requests for copies, when made, should be directed to the source of the communication through proper channels.

WD Technical Bulletin  
TB MED 114  
9 Nov. 44  
(Restricted)

Immunization. Rescinds S.G.O. Cir. Letter No. 162, 28 Nov. 1942, and all other S.G.O. directives on immunization. Sets out standards, procurement, shipment, and storage of prophylactic biologicals; precautions to be taken when administering biologic products; technical instructions; and immunization records.

WD Circular No. 447  
24 Nov. 44  
Sect. I

Army Nurse Corps personnel on duty in hospitals will not be assigned to nonnursing duties which can be delegated to subprofessional personnel.

AR 35-4220  
17 Nov. 44

The payment of subsistence allowance to an officer while sick in hospital under the provisions of AR 35-1440 is authorized.

AR 55-165  
16 Nov. 44  
C 2

Duties of Veterinary Officers Accompanying Shipment of Animals. At rest stops, the veterinary officer accompanying the shipment will inspect the facilities for watering and feeding and sanitary conditions and will record his findings on the bill of lading.

WD Circular No. 454  
29 Nov. 44  
Sect. IV

Madigan General Hospital. Address changed from Ft. Lewis, Wash., to Tacoma, Wash.

WD Circular No. 454  
29 Nov. 44  
Sect. VII

Typhus Vaccine. Expiration date thereof changed from twelve to eighteen months from date of manufacture. All lots of such vaccine (ASF Catalog, MED 3, Item No. 1612800) bearing expiration date in 1944 and 1945 will be used for six months after stated expiration date.

WD Circular No. 458  
2 Dec. 44

Line of Duty. Refers to AR 40-1025 and AR 345-415. Sets forth detailed instructions to govern determination of line of duty status in disease or injury cases. Rescinds W.D. Cir. No. 205, 1944.

AR 605-12  
C 1  
9 Dec. 44

Promotion. Changes AR 605-12, 17 August 1944. Any second lieutenant (including nurses, dietitians, and physical therapists) who has completed eighteen months' service in that grade may be promoted to first lieutenant without regard to T/O or allotment vacancies where he is qualified for promotion. Oversea service to count time and one-half. Not to be construed as granting automatic promotion but is to be applied to those denied promotion because of lack of positions established for higher grade.

WD MEMO 35-44  
21 Dec. 44

Per Diem. Authorizes reimbursement on per diem basis to student officers attending service schools on temporary duty. Per diem rates for service schools, including Medical Department schools, to be paid as specified.

ASF Headquarters  
Circular No. 1  
2 Jan. 45  
Part I, Sect. I

Maintenance. War Department policy requires that technical manuals and bulletins pertaining to equipment contain adequate maintenance information. Sets forth instructions designed to ensure use of current maintenance information.

ASF Headquarters  
Circular No. 2  
3 Jan. 45  
Part II, Sect. III

WD Circular No. 485  
29 Dec. 44

ASF Headquarters  
Circular No. 10  
9 Jan. 45  
Part II, Sect. IV

ASF Headquarters  
Circular No. 10  
9 Jan. 45  
Part III, Sect. IX

WD Pamphlet 38-6  
Jan. 45

ASF, Headquarters  
Circular No. 26  
23 Jan. 45  
Part II, Sect. III

ASF, Headquarters  
Circular No. 30  
26 Jan. 45  
Part III, Sect. VI

WD Circular No. 46  
7 Feb. 45  
Sect. V

WD Circular No. 47  
8 Feb. 45  
Sect. V

**WAC. Hospital Duties.** Provides: (1) WAC personnel will not be assigned to male hospital detachments; (2) where not sufficient WAC hospital personnel to justify separate WAC hospital detachment, such WAC personnel will be administered by appropriate WAC detachment on post, camp, or station; (3) commanding officer of hospital to coordinate with WAC detachment commander the duty schedule of WAC personnel assigned to hospital duties.

**Relief from active duty.** Sets forth complete statement of W.D. policy on relief of officers from active duty. Applies to commissioned officers (except Regular Army), Army nurses, dietitians, and physical therapists.

**Assignment. Medical Department Personnel.** Directs commanding officers of redistribution stations to ensure that all returnees who are trained and experienced Medical Department personnel are reassigned to appropriate Medical Department duties. All command echelons in A.S.F. directed to assign Medical Department personnel to medical duties and to ensure that such personnel are not assigned to other arms or services or to positions which may be filled by personnel outside Medical Department.

**Shipment.** Sets forth procedure to provide replacement of supplies lost or rendered unserviceable because of loss of a vessel. Provides that chiefs of technical services will replace lost items on receipt of notice from Director of Supply, Headquarters A.S.F.

**Baggage List.** Lists items of clothing and equipment which are required to be taken overseas by enlisted personnel when prescribed by movement orders.

**Filariasis.** Effective 1 Feb. 1945, each A.S.F. station, regional convalescent, and named general hospital in U. S. will enter on W.D., A.G.O. Form 8-24, in each instance where cause of admission is filariasis, certain specified information relating to filariasis. Such information to be used to determine policies with regard to hospitalization, disposition, and public relations in connection with the disease. All copies of W.D., A.G.O. Form 8-24, including special data re filariasis, to be mailed to S.G. with regular sick and wounded report.

**Regular Army.** Refers to Sect. III, W.D. Cir. No. 356, 1944, and par. 3c, Sect. X, A.S.F. Cir. No. 328, 1944, and makes provisions re release of Regular Army officers for overseas service after completion of two years' service in Washington.

**Discharge.** Directs that all enlisted men hospitalized for chronic, symptomatic peptic ulcer be considered for separation from service, except in cases where such enlisted men possess unusual qualifications for service.

**Women Military Personnel.** Authorizes theater commanders to return to U. S. any woman officer or enlisted woman whose husband has been returned from overseas to U. S. for reassignment, hospitalization, or honorable discharge.



## COMPLEMENT FIXATION IN HUMAN MALARIA

Although various serologic reactions in malaria in man have been reported, attempts to obtain a specific complement-fixation reaction have been inconclusive because no specific, sensitive, and easily standardized antigen was available. Coggeshall and Eaton developed an antigen from *Plasmodium knowlesi* which occurs naturally in malaria of monkeys and can be used to induce malaria in man. When the onset of war made the procurement of monkeys impracticable, Coggeshall and Frisch prepared an antigen from the chicken malarial parasite, *Plasmodium gallinaceum*. Using the sera of soldiers with malaria at the Percy Jones Hospital, Frisch demonstrated the group specificity of this antigen.

As further studies seemed desirable, serologic investigation was made at the Harmon General Hospital on 11,367 samples of sera. These sera were obtained from 505 soldiers known to have had malaria while in the South Pacific Area; from 1,000 normal, healthy soldiers, none of whom had been overseas or had a history of malaria; from 95 nonmalarial, febrile patients who had never been overseas and had never had malaria, but whose temperature was not less than 100° F. when the initial blood specimen was drawn; and from 481 Negro soldiers with syphilis who had never been overseas. During the period of study, the group of 505 soldiers from the South Pacific had 434 recurrent attacks of malaria proved by blood examination to be due to *Plasmodium vivax*. Sera were obtained from the last-mentioned group at five-day intervals but when a recurrent attack developed, sera were taken on the day of onset, on each of the next four days, and thereafter at five-day intervals. The antigen used in these tests was supplied originally by Coggeshall and Frisch and subsequently by the Army Medical School. Details of the technique and of the results of making the tests are given in this report.

Summarizing the results of this study, the sera from the 1,000 healthy soldiers were negative in 99 percent of the tests. The sera obtained on five successive days from the 95 soldiers with febrile illnesses other than malaria were negative in 96 percent of the tests. Sera from 481 syphilitic men without a history of malaria were negative in 93 percent of the tests. The results of the tests on sera from the 505 soldiers known to have had malaria in the South Pacific Area were as follows: (1) From this group, 9,411 sera were positive in 30 percent of the tests. (2) A maximum of 58 percent positive tests was obtained on any one of five successive days during 234 recurrent attacks. (3) Complement-fixation tests before and after 300 recurrent attacks showed that: five days before the attacks 33 percent of the tests were positive; five days after the attacks 47 percent were positive; and twenty days after the attacks, 33 percent were positive. (4) In 121 patients followed for six months at

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Abstract of a paper by Lieut. Col. Stuart W. Lippincott, M.C., A.U.S., Major Harry H. Gordon, M.C., A.U.S., Captain William B. Hesselbrock, Sn.C., A.U.S., and Colonel Alexander Marble, M.C., A. U. S., to be published in May 1945 in The Journal of Clinical Investigation.

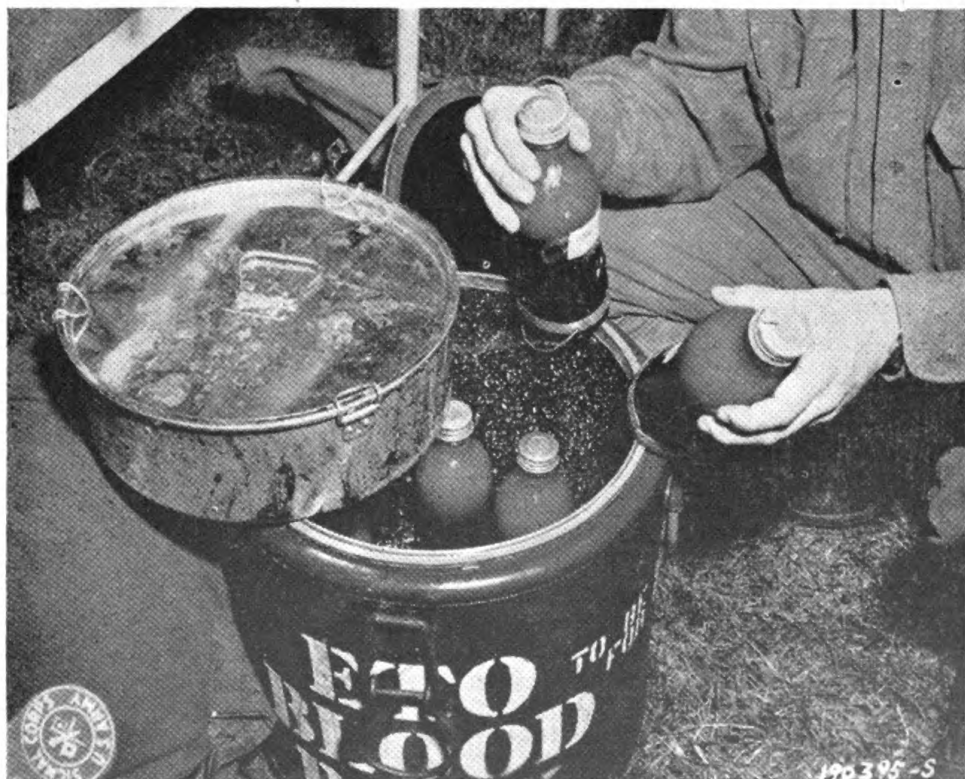
five-day intervals, 95 had recurrent attacks during the period of study, whereas the remaining 26 had no attacks during that period. The sera from all of these men, exclusive of the period of attacks, showed that only 36 percent of the tests were positive.

Analysis of the results, including the titer of positive tests, for each day during the clinical attack, showed that no constant serologic response characterized the attacks as a whole. No evidence was obtained of any correlation between the number of previous attacks and the complement-fixation tests. Among 891 tests in 100 intervals between attacks in 76 patients, only 33 percent were positive. The results of this study indicate that the complement-fixation test using an antigen made from *Plasmodium gallinaceum* gives a group reaction of undetermined sensitivity for the sera of human beings infected by *Plasmodium vivax*, but is of no practical value in detecting latent malaria or indicating when the patient is cured.

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An Otolaryngology Branch has been established in the Surgical Consultants Division of The Surgeon General's Office. Major Leslie E. Morrisett, M.C., has been appointed chief of the branch, which will concern itself with all matters pertaining to otolaryngology in the Army.

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Container for whole blood being shipped to the field hospitals in France. Dry ice in the container keeps the blood at the proper temperature. France, 12 June 1944.

## TRIBUTES TO ARMY NURSES AND THE MEDICAL DEPARTMENT

Extract from interview between Mrs. Clare Boothe Luce, member of Congress, and Sergeant Nancy Grant, W.A.C., during Mrs. Luce's recent visit to the Italian front.

I wish you might have visited as many hospitals as I have here and in other war theaters, and talked with as many GIs and doctors about our Army nurses. When the hospitals are full of battle casualties, as they were in the days of Salerno and Anzio, nurses sometimes work for several days without sleep. They are often right under the guns, and they see, even as the GI himself doesn't see, the end horror of war, the terribly wounded man. The front-line nurse is in a niche all by herself in this war. To their patience, care, fortitude, and courage, is largely due the fact that of all the gripes the soldier has about this war, the one gripe he hasn't is about the magnificent care he gets when he is wounded.

Extract from an article by Mr. Forest Harness, member of Congress, who recently visited the American fighting forces in Europe, published in the Washington, D. C., Daily News, 30 January 1945.

Our allies are often amazed at the scope and thoroughness of our services for our personnel, at our lavish expenditures of matériel, but we consider it the best possible investment. Nothing better illustrates this than our medical service, which is nothing short of miraculous. Protected only by their insignia, the corpsmen go wherever an American soldier goes. Among men to whom bravery is commonplace the corpsmen are deeply respected. Infantrymen, who get a small bonus for combat service, think so much of the men with the Red Cross arm bands that the combat pay in many units is pooled and shared equally with the "medics," who so far have not been similarly rewarded.

The same spirit shows through our whole medical service. If a wounded man has a spark of life in him, the corpsmen will ignore their own safety to keep that spark alive and bring him back to a field station. Doctors and nurses at the station may be numb with fatigue, but they will fight to sustain that life and get the man on back to a general hospital, probably by plane. Our evacuation of casualties by air is an epic story in itself. All of this is a huge investment, probably not even approximated in any other army. But it pays rich dividends, as proved by the great percentages of wounded men who live. I visited field and general hospitals all the way from England down into Italy, and have nothing but praise and admiration for the inspired service the men and women of the Medical Corps are rendering.

On the forty-fourth anniversary of the Army Nurse Corps, on 2 February, Major General Paul Hawley, Chief Surgeon, European Theater of Operations, said: "One of the most glorious pages in the history of the Army Nurse Corps is being written today. The job they are doing is magnificent. A steadfast, loyal ally of the medical officer and soldier patient in the fight against death and pain, it is often the personal interest of the nurse, her pleasant and efficient ministrations, that start her patients toward recovery. To quote a wounded soldier, 'God bless our nurses. A part of every soldier's heart is reserved for them.' "

Commenting on the serious shortage of nurses in hospitals overseas and in the United States, General Hawley said that the critical lack of nurse reinforcements has forced the Medical Department three times to reduce the number of nurses stationed with each hospital. There were 120 nurses to a 1,000-bed Army general hospital in 1940; the number was cut to 105 in 1943, and to 83 in 1944. At the same time, the bed capacity of many hospitals has been increased. "Unless we get replacements, we shall be about 2,000 nurses short in this theater within the next two months. Nurses who have been overseas for more than two years are working often as long as sixteen hours a day. The Army nurse is a good soldier; she asks no favors. But she is becoming tired. There is only one solution: We must have more nurses."

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### STEREOPSIS IN ROENTGENOLOGY

Stereoroentgenograms are usually taken by shifting the tube a distance equal to the average interpupillary distance, which is  $2\frac{1}{4}$  inches. Recently, a reduction of the tube shift has been advocated to make the films easier to read and to give greater depth perception (Garret, *Bull. U. S. Army M. Dept.*, 82:117, Nov. 1944; Klein et al., *Am. J. Roentg.*, 49:682-690, May 1943). A review of the physiology of binocular vision indicates that this shortening facilitates stereoscopic fusion but at the same time diminishes depth perception, thus sacrificing the very sharpness of localization for which stereoscopic films are taken.

While it is assumed that a shadow is different from a picture, they are both projections of an object onto a flat plane. The x-ray shadow is in outline, like a winter forest in the moonlight. The picture, in addition, has all of the surface details. As such, they are each received onto the retina and transmitted to the brain for interpretation. The lack of surface details in the x-ray makes fusion more difficult, but the roentgenologist's familiarity with the subject compensates for this.

Because difficulty was experienced in fusing films with a shadow displacement of over  $\frac{3}{8}$  inch, it was assumed that reducing the tube shift sufficiently to yield films with a shadow displacement of  $\frac{3}{8}$  inch or less gave more successful stereoroentgenograms. Now, binocular vision has three stages (Worth, "Squint, Its Causes, Pathology, and Treatment," Blakiston, 1915): (1) simultaneous vision in each eye, (2) fusion of these two separate images into one image, and (3) perception of depth.

In reading stereoroentgenograms it is assumed that (1) is present. Shortening the tube shift results in easier fusion of the images, for it makes them similar. On the other hand, by making them more similar to facilitate fusion, stereopsis is diminished. For it is this very disparity of the images which allows the roentgenologist to see "into" the object. This can easily be demonstrated by closing one eye, looking at a book on the table, and moving the head back and forth, first  $\frac{3}{8}$  inch and then  $2\frac{1}{2}$  inches. A more accurate estimate of depth is gained with the greater movement. Thus, by shortening the tube shift in taking "stereos." the films are easier to fuse, but depth perception is lessened.

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## Induction Examinations

About 8,800,000 selective service registrants were examined during 1943 and 1944 at local boards and armed forces induction stations to determine their fitness for military service. About 3,000,000 of them were rejected; more than 800,000 men were found fit for general or limited military service on preinduction examinations but were not subsequently forwarded for induction during this period, and almost 5,000,000 men were inducted. About 3,400,000 men or 68 percent of those inducted were assigned to the Army and the rest to the Navy, Marine Corps, or Coast Guard.

Under the procedure in effect in 1943, selective service registrants examined at induction stations were, with few exceptions, inducted or rejected. This procedure was modified in January 1944 to provide for preinduction examinations at induction stations. After that time registrants were generally not forwarded for induction until their acceptability for military service had been determined at a preinduction examination. Registrants forwarded for induction within ninety days of being found acceptable at a preinduction examination were given a physical inspection and rejected only if manifestly disqualifying conditions were found. Registrants forwarded for induction more than ninety days after being found acceptable at a preinduction examination were given a complete re-examination and inducted or rejected accordingly.

The work of determining the physical and mental fitness of selective service registrants for military service fell almost entirely on the induction stations. Only registrants with manifestly disqualifying defects were rejected by local boards, and these constituted only about 4 percent of those examined during the two-year period. The induction stations made more than 9,600,000 complete examinations, not including physical inspections at time of induction to men who had passed a complete preinduction examination within the preceding ninety days. Some men were examined more than once. *The trend of the rejection rate at*

TABLE I  
*Trend of rejection rates at armed forces  
induction stations\**

Month of examination	Percent rejected	
	Unfit for general or limited military service	Unfit for general military service
Jan. 1943	28%	—
Feb.	30	—
Mar.	30	—
Apr.	36	—
May	38	—
June	37	—
July	38	—
Aug.	40	—
Sept.	42	—
Oct.	42	—
Nov.	42	—
Dec.	42	—
Jan. 1944	40	—
Feb.	36	—
Mar.	36	—
Apr.	31	—
May	31	—
June	(33) See note	36
July	(35) " "	38
Aug.	(37) " "	40
Sept.	(38) " "	41
Oct.	(41) " "	44
Nov.	(41) " "	45
Dec.	(40) " "	43

Note: Limited service men were not inducted after May 1944 and the rejection rates in parentheses are shown only for comparison with earlier months.

\* Induction examinations of men found acceptable on preinduction examination are not included.

From the Medical Statistics Division of The Surgeon General's Office.

armed forces induction stations during the past two years is shown in table I. These rejection rates overstate the proportion of registrants rejected because of repeated rejections of some registrants who were forwarded for examination two or more times by their local boards. The principal changes in the rejection can be accounted for as follows:

1. *An increase in the rejection rate from 28 percent in January 1943 to 42 percent during the last four months of 1943* reflected mainly an increase in the ages of the registrants examined and a tendency for the proportion of previously rejected men among the registrants forwarded for examination to rise as local boards experienced increasing difficulties in meeting their calls.

2. *A decrease in the rejection rate from January 1944 through May 1944* reflected the very large number of registrants forwarded for preinduction examination during these months. The ages of these registrants tended to decrease after February and the proportion of previously rejected men decreased. Moreover, the large numbers examined taxed the capacity of the induction stations with the result that examinations tended to be less thorough than during the immediately preceding months or subsequently.

3. *Increase in rejection rate beginning in June 1944.* Limited service men were not inducted, beginning in June 1944. The rejection rates for June and subsequent months represent, therefore, the percent unfit for general military service rather than the percent unfit for general and limited military service, as previously. The effect of discontinuing the induction of limited service men is shown in the figures in parentheses for the months from June through December 1944 (see table). Also in June 1944 the psychological tests for mental capacity were modified in the light of the accumulated experience in training previously inducted illiterates; the modified tests had the effect of rejecting some illiterates who would have been inducted under the tests used up through May 1944.

4. *A rise in the rejection rate from July through November 1944* is believed to reflect greater emphasis on the need for inducting men suitable for combat replacements. In September War Department Circular No. 370 provided for the discharge from service of men falling below the minimum induction standards for limited service and for whom appropriate positions were not reasonably available. This gave additional emphasis to the necessity for inducting only men unquestionably qualified for service.

5. A factor which operated over the two-year period and tended to increase the rejection rate was the decline in the rejections made by local boards from about 6 percent of those examined during 1943 to about 2 percent during the latter months of 1944.

#### REJECTION RATES ON FIRST EXAMINATION AND RE-EXAMINATION

Since August 1944 the results of examinations at induction stations have been reported according to the registrants' previous examination status. The number of examinations and rejections and the rejection rate for the period August through December 1944 were as in table II.

From August through December 1944 more than 500,000 (483,119 + 31,155) registrants who had not been examined previously were examined. There were about 200,000 rejections among these men, equivalent to a rejection rate of about 40 percent. The rejection rate for registrants who had passed their preinduction examination and were forwarded for induction within ninety days thereafter was 3 percent, while for those forwarded more than ninety days after passing their preinduction examination the rejection rate was 18 percent. The higher rejection rate in the latter group is partly a reflection of the low rejection rate on preinduction exami-

nations during the early part of 1944, and partly a natural consequence of the difficulty of determining the acceptability of borderline cases, the latter also being largely responsible for the fact that 40 percent of some 68,000 men previously rejected were found fit for service during this period.

No great significance can be attached to the relatively high rate of rejection shown on preinduction examinations for men previously found acceptable. This group of men was small in number and probably was

TABLE II

Previous examination status of registrant	Number of examinations	Number of rejections*	Percent rejected*
<b>Preinduction examinations</b>			
Not previously examined	483,119	195,346	40.4%
Previously examined—total	70,786	42,061	59.4%
—Rejected on previous examination	63,247	39,038	61.7%
—Acceptable on previous examination	7,539	3,023	40.1%
<b>Total preinduction examinations</b>	<b>553,905</b>	<b>237,407</b>	<b>42.9%</b>
<b>Induction examinations</b>			
Not previously examined	31,155	9,997	32.1%
Rejected on previous examination	4,899	2,041	41.7%
Acceptable on previous examination—total	421,974	41,002	9.7%
—Reporting for physical inspection†	234,925	7,021	3.0%
—Reporting for complete re-examination†	187,049	33,981	18.2%
<b>Total induction examinations</b>	<b>458,028</b>	<b>53,040</b>	<b>11.6%</b>

\*Since 1 June 1944 limited service men have not been inducted, and registrants qualified only for limited service have therefore been included with rejections.

†Registrants who report within ninety days of acceptance at a preinduction examination are given a physical inspection while registrants reporting after ninety days are completely re-examined.

composed, in part, of registrants who felt they had been erroneously classified as acceptable and consequently proceeded to assemble additional medical evidence to substantiate their contention on re-examination.

The following considerations should be noted with regard to the rejection rate at induction examination of men previously found acceptable:

1. The rejection rate on physical inspections and re-examinations combined has been determined largely by the proportion of men given physical inspections. This is because the rejection rate on re-examinations has been several times as high as the rejection rate on physical inspections. Because of the large pool of men found acceptable on preinduction examinations during the early part

TABLE III

	Percent rejected at physical inspection	Percent rejected on complete re-examination	Percent rejected at physical inspection and complete re-examination
February	2		2
March	1		1
April	2		2
May	2		2
June	3		3
July	3		3
August	3	12	6*
September	3	15	9
October	3	20	11
November	4	25	13
December	3	21	11

\*Estimated.

of 1944, about 44 percent of previously acceptable men forwarded for induction during the last five months of 1944 had to be completely re-examined because more than ninety days had elapsed since their preinduction examination.

2. The rejection rate of 18 percent for men previously found acceptable who were re-examined for induction during the period August 1944 through December 1944 must

be interpreted in the light of the relatively low rejection rates on preinduction examinations during the first part of 1944. The necessarily less thorough preinduction examinations during the spring months of 1944, when very large numbers of registrants were being examined, produced a large pool of supposedly general service registrants who were not needed to fill the spring and early summer induction calls. These registrants were called up in increasing numbers during the late summer and fall and the opportunity for more thorough examinations at that time resulted in the rejection of many of them. Thus the recent high rejection rates among previously acceptable men were to some extent a consequence of the low rejection rates of the early months of 1944. Since this was a temporary condition, it is probable that the rejection rate among previously acceptable men will decrease somewhat in the future.

The trend from February through December 1944 in the rate of rejection at induction examination among men previously found acceptable is indicated in table III.

#### ANALYSIS OF REJECTION RATE

The rejection rates shown above provide a basis for estimating the proportion of a group of registrants not previously called up by their local boards who may ultimately be expected to qualify for general military service. The problem is one of tracing a group of men not previously examined from their first screening by local boards, through the examinations at armed forces induction stations, to their final acceptance for general service or rejection. The rejection rate at first examination for a group of men not previously examined will be higher than the percentage of men ultimately rejected in the group because re-examination of the rejected men will salvage a certain proportion of them. A rejection rate developed from examinations of men not previously examined can, therefore, be regarded as an upper limit to the true rejection rate. It is difficult to estimate the proportion of all rejected men who may ultimately be salvaged, because accurate data are not available as to how many of a group of rejected men may eventually be sent up for re-examination. Men with irremediable defects will constitute the large majority of the rejected men so that perhaps not more than 25 percent of all rejected men are likely to be sent up for re-examination. Of those sent up for re-examination about 40 percent have been salvaged for military service.

On the basis of the experience during the last five months of 1944, it is estimated that a group of 1,000 men of the same age distribution and general characteristics as those examined during this period would yield about 615 men acceptable for general military service and about 385 rejects. At their local board screening about 2 percent or 20 men would be rejected for obvious disqualifying defects and the remaining 980 would then be forwarded to induction stations for examination. Of the 980, about 920 would receive preinduction examinations on which the rejection rate during the period under consideration was about 40 percent with the result that 552 would be found acceptable and 368 rejected if this experience held good. The remaining 60 men would have applied for immediate induction and would receive induction examinations on which 41 would be found acceptable and inducted and 19 (32 percent) would be rejected. If the 552 who were found acceptable at preinduction examinations were forwarded for induction within ninety days 535 would be accepted and 17 (or 3 percent) would be rejected. Through the first series of examinations 576 would thus have been found acceptable or inducted while 424 (or about 42 percent) would have been rejected. About 106 (25 percent) of the rejected men may, at a later date, be considered salvageable by their local boards and sent up for another preinduction examination on which



40 would be found acceptable and 66 (or 62 percent) would be rejected. About 39 of the 40 men who were found acceptable upon second preinduction examination might be expected to pass a physical inspection if sent up within ninety days. The final picture then shows that out of the original group of 1,000 registrants about 615 might ultimately expect to be inducted while the remaining 385 (or about 39 percent) would be rejected.

If instead of being forwarded for induction within ninety days after their preinduction examination, the 552 men found acceptable had been forwarded after more than ninety days had elapsed, only about 453 of them would have been inducted and 99 (or 18 percent) would have been rejected. Under this second assumption 494 would have been inducted during the first series of examinations as compared with 576 under the previous assumption. As indicated, the 18 percent rejection rate considered here is believed to be an aftereffect of the low preinduction examination rejection rates which prevailed during the early months of 1944 and would probably have been materially lower under more stable conditions. Furthermore, of the group that were rejected on induction examinations after passing complete preinduction examinations at least ninety days earlier, the proportion of men likely to be salvaged on re-examination would be relatively high. In the long run, the difference between the

numbers rejected in the case where men are sent up for induction within ninety days after passing preinduction examinations and the case where they are sent up after more than ninety days have elapsed should tend to represent merely the disqualifying defects acquired or brought to light during the intervening period.

These examples here considered should not be used as representative of actual conditions over any length of time. Changes in the age, race, or general characteristics of the registrants as compared with those examined during the last five months of 1944 as well as changes in standards of acceptance would yield different rejection rates.

#### CAUSES OF REJECTION

Throughout 1943 and 1944 there was a steady rise in the proportion of rejections for neuropsychiatric condi-

TABLE IV  
*Causes of rejection among registrants not previously examined and registrants previously found acceptable*

(Examinations at armed forces induction stations August 1944 through December 1944)

Cause of rejection	Preinduction examinations of men not previously examined	Induction examinations of men previously found acceptable*
Rejection rate (all causes)	40.4%	9.7%
Percentage distribution by cause of rejection		
Mental deficiency	16.6%	10.5%
Psychosis	0.3	0.3
Other psychiatric	29.2	31.2
Total mental	46.1	42.0
Neurological	2.5	2.6
Eye defects	3.8	2.0
Ear, nose, sinus, and throat	4.6	3.1
Pulmonary tuberculosis	2.0	1.7
Other respiratory	2.0	2.3
Hypertension	1.4	2.6
Cardiovascular	4.7	4.6
Gastro-intestinal	0.9	1.2
Genito-urinary, excluding VD	2.1	2.3
Syphilis	0.2	2.4
Hernia	2.8	2.0
Flatfoot	2.9	4.5
Other musculoskeletal	7.4	8.7
Other physical	6.9	8.5
Total physical	44.2	48.5
Administrative	1.5	3.8
Limited service	8.2	5.7
Total all causes	100.0	100.0

\* Includes both physical inspections and complete re-examinations, but 83 percent of the rejections are from the complete re-examinations.

tions. This was largely a consequence of efforts to prevent the induction of men having, or predisposed to, psychiatric disorders. From August 1944 through December 1944 psychiatric disorders other than mental deficiency accounted for 29.5 percent of all rejections at preinduction examinations at induction stations among registrants not previously examined while mental deficiency accounted for another 16.6 percent. Thus these two types of rejections together accounted for almost one-half of all rejections.

Interest has been aroused in the accuracy of psychiatric diagnoses at induction station examinations, because of the large number of men rejected for psychiatric conditions and because the appraisal of a registrant's psychiatric fitness at an induction station had to be made in only a fraction of the time that might have been devoted to such an examination in civilian practice. Some indirect evidence on this point is available from a comparison of the causes of rejection among registrants not previously examined who are forwarded for preinduction examination and the corresponding rejections among previously acceptable registrants forwarded for induction. This comparison is shown in table IV.

The re-examination of previously accepted men provides a rough means of gaging the effectiveness of the original screening, especially in regard to relative effectiveness in dealing with various classes of defects. A small proportion of men found acceptable the first time may be expected to be rejected on re-examination because of the impossibility of establishing a sharp line of demarcation between men who are fit and those who are unfit for military service; thus, some borderline cases who are considered acceptable on one examination will be considered unacceptable on another examination. However, any marked increase from the first to the second examination in the proportion of rejections falling within a particular defect category would point to less than average effectiveness in dealing with defects in that category.

In the light of the foregoing considerations it is noteworthy that so little variation was found between the rejection rates for the two groups of men by defect categories. Psychiatric rejections, excluding mental deficiency, accounted for practically the same proportion of rejections in each group of men. Physical causes of rejection also accounted for practically the same percentage of the rejections on re-examination as on first examination. So far as this evidence goes, therefore, the psychiatric part of the examination was just as conclusive as the physical part. In other words, there was no more variation in appraising psychiatric fitness than in appraising physical fitness.

Reference to the above table shows that hypertension, syphilis, and flatfoot accounted for an appreciably greater proportion of rejections on re-examination than on first examination. The relatively higher rate for syphilis was due to the practice of deferring spinal puncture tests for neurosyphilis until the induction examination. Hypertension and flatfoot would seem to illustrate types of defects which are particularly difficult to appraise at an induction station examination. The somewhat lower percentage of rejections for mental deficiency on re-examination than on first examination arose partly from the fact that no psychological tests of mental capacity were given in conjunction with the physical inspection of men reporting within ninety days of passing a preinduction examination, but, in part, reflected a fairly high degree of consistency in the scores achieved

on the psychological tests given on preinduction examinations and on the complete re-examinations for induction. The scores on the psychological examinations would have been even more consistent (and the rejections for mental deficiency on re-examination correspondingly fewer) except for the change which was made in June in the tests used. This change in the psychological tests meant that some registrants who took the old test on preinduction examination before June were required to pass the new (more difficult) test when re-examined for induction later in the year.

As compared with 1943 the rejection experience during the latter part of 1944 showed an increase in the proportion of rejections due to mental conditions and a decrease in the proportion of rejections due to syphilis. The decrease for syphilis is attributable to the removal during the latter part of 1943 of the restrictions previously imposed on the number of syphilitics who could be inducted, with the result that an unusually high proportion of syphilitics were forwarded for examination at that time. Other causes of rejection did not change significantly in relative importance.



This Fifth Army mule had an eye removed at an Italian hospital at Cafaggiolo, 12 October 1944. Signal Corps photograph.

## Penetrating War Injuries of Brain

### Desirability of Early Definitive Surgery

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The two basic factors controlling the attainment of prompt recovery and early return to military or civil duties in patients with penetrating wounds of the brain are the prevention of infection and the prevention of further damage to the brain. In the last World War, standardization of surgical treatment was found to be the key to success in this endeavor, and standardization of early neurological surgical procedures in this war should achieve similar results; however, an insufficiency of thoroughly trained neurological surgeons exists, and it does not seem possible in the forward areas to channel casualties with craniocerebral wounds into a specialized unit. The general surgeon is therefore called on and expected to be able to care for patients of this sort.

A study of the various techniques used in one theater in this war in the early care of head injuries and of the progress in each case has been made to illustrate the advantages of adhering as closely as conditions permit to the usually accepted principles of neurological surgery. The observations were made in the Southwest Pacific Theater in an experience of twelve months in a large evacuation hospital and twelve months in a large station hospital. The cases presented are selected because they best illuminate the discussion.

#### CASE REPORTS

CASE 1. A native litter bearer, admitted to the author's service on 1 December 1942, had received about seven days previously a perforating wound of the right frontoparietal region (figure 1). He had at the time of admission a complete left-sided hemiplegia, was very restless, uncooperative, gave no evidence of understanding "pidgin" English, but did talk and understood the word "kai-kai" (food). Less than thirty-six hours following injury, the patient had been operated on at another hospital for a brain abscess. A scalp flap was turned, exposing the compound fracture of the skull and revealing moderate cerebral herniation through the wounds of entrance and exit. A few bone fragments were picked out, the brain and skull irrigated with normal saline and the scalp flap sutured in its previous position with interrupted silk sutures. The wounds of entrance and exit were left open and were not débrided. No brain abscess was found. The patient was very difficult to handle, refused to eat American food, and ate very little of the food supplied by the natives. He rapidly became undernourished, and it was desirable to transfer him to a native hospital which better understood native diets. Since this native hospital was not equipped



to care adequately for such a brain injury, a secondary closure to cover the cerebral herniation was planned for the earliest possible date. On 6 December 1942, when the herniation was minimal and free of drainage and the scalp had begun to granulate cleanly

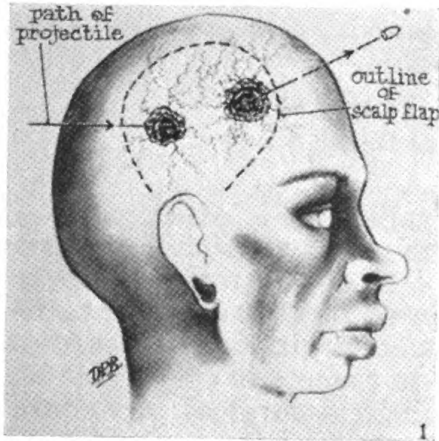


FIGURE 1. (Case 1) The dashes indicate the scalp flap turned prior to admission in the search for a brain abscess. Fracture lines are indicated.

at the edges, the borders of the wounds were resected and the wounds closed by a single row of interrupted silk sutures passed both through scalp and galea. Closure was accomplished without undue tension except at one angle which subsequently broke down to form a small sinus tract; however, the hernia was successfully covered. His condition gradually deteriorated and on 12 December 1942 in spite of supportive efforts he died of inanition. Though an autopsy was not done, his course did not suggest intracranial or other infection. There had been no improvement in his paralysis.

CASE 2. A man was hit in the left parietal region by a high explosive bomb fragment during an air raid on 11 March 1943. He sustained a lacerated wound of the scalp 3 1/2 inches long with compound, comminuted fracture of the underlying bone (figure 2). Many fragments were depressed and indriven and the brain was lacerated. In a field hospital, shortly after injury, the wound was débrided, bone fragments removed, brain exposed, and the scalp left widely open. A small hernia cerebri developed. During air evacuation on 14 March 1943, the date he was admitted to our hospital, his cerebral herniation increased. At our examination he was semistuporous, aphasic, and had marked apraxia of the right hand and weakness in the right side of the face and right hand and fingers. An x-ray showed a 2 by 6 cm. defect in the left parietal bone anterior to the lambdoidal suture. Two large fracture lines extended anteriorly from the defect. No foreign bodies or bone fragments were observed. Under dehydration, bed rest, and chemotherapy the cerebral herniation subsided, speech improved slowly, and strength improved in the right hand and facial muscles. The wound was secondarily sutured seven days after injury, after resecting the granulating edges. It could not be entirely closed without tension, and a cerebrospinal fluid fistula formed near the middle of the wound. On 6 April 1943 perimetric visual field examination demonstrated a right homonymous hemianopsia. He still gave evidence of bilateral astereognosis and also had a slight residual aphasia, chiefly of sensory type. Otherwise examination this date was negative. He was evacuated to the rear on 13 April with no evidence of cerebral herniation. The fistula was nearly closed by granulation tissue, and there was no evidence of infection.

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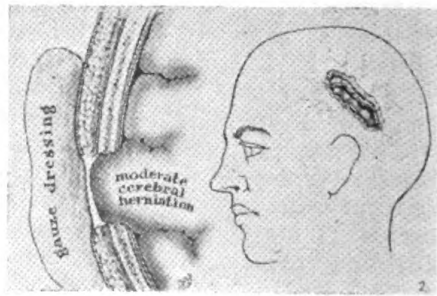


FIGURE 2. (Case 2) Condition of gutter type wound on admission. Only a superficial débridement had been done. Moderate cerebral herniation was already present. Dotted lines indicate course of fracture lines.

The débridement done in the field hospital in this case was adequate and left the wound in good condition. Since this patient had to be evacuated by air and at a relatively high altitude, it would have been beneficial and his convalescence thereby shortened if some means could have been used to minimize the danger of increased cerebral herniation. This might be accomplished by means which will be considered subsequently.

CASE 3. On 25 September 1943 a bomb fragment penetrated a soldier's helmet and the right frontoparietal region of his skull producing a compound, comminuted stellate fracture; the fragment passed beneath the superior sagittal sinus and came to rest in the left parietal region beneath the skull (figure 3). He arrived at an Australian casualty clearing station fifty-four hours after injury. At that time he was lucid, alert, quiet, pupils were equal, left arm and face definitely weak. His wound showed a hernia cerebri already present. As the surgeon felt it was already too late for débridement, none was done. His wound remained clean and his course afebrile, and he was ultimately evacuated to our hospital, arriving fifteen days after injury. At that time his attention was poor, and he gave evidence of personality changes. Orientation and memory seemed unimpaired.

The upper and lower abdominal and cremasteric reflexes on the left were unobtainable; there were questionable weakness of the left side of his face and definite slight weakness with apraxia of the entire left arm and hand; adiadosokinesis was present on the left. There was a circular hernia cerebri about 3 cm. in diameter with protrusion about 2 cm. above the scalp level, in the right frontoparietal region. Immediately a regimen of dehydration by limitation of fluid intake was begun. By this means and by elevation of the head of the bed, the herniation was reduced

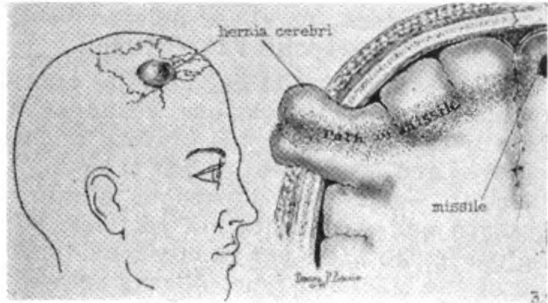


FIGURE 3. (Case 3) Severe hernia cerebri developed in this penetrating wound, which did not reach a medical installation able to give definitive care until fifty-four hours after the injury. The dashes indicate position of fracture lines as seen in x-ray.

in the next nine days. He was given sulfadiazine, 1 gm., four times daily. On 19 October 1943, twenty-four days after injury, a secondary closure of the scalp over the exposed bone and brain was done under local anesthesia, and six days later a small amount of purulent material appeared at the central part of the wound from which *Staphylococcus albus* was cultured. The drainage tract persisted and a few small bony sequestra appeared in the drainage. X-rays of the skull showed no evidence of osteomyelitis at this time. On 17 November 1943 the line of previous incision was partly opened, a narrow border of softened bone along the vertical fracture line was curetted away, and a drain left in the wound for forty-eight hours. Slight drainage subsequently recurred through the tract formed by the drain. His weakness in the left face and hand cleared with the reduction of the hernia cerebri, and his attention, perception, and personality rapidly improved to what was considered normal. It was felt that removal of the foreign body would be necessary to arrest the drainage, and he was evacuated to the rear on 1 January 1944, at which time he was ambulatory, had no cerebral herniation, and though there was a drainage tract, brain was not exposed in this wound.

In a rear hospital, on 21 January 1944 he underwent a left parietal craniotomy with removal of the foreign body which weighed  $1\frac{1}{2}$  ounces. The wound was closed per primam and he was given penicillin (1,000,000 units over a ten-day period) under which all evidence of infection cleared and the wounds healed. He was evacuated to the United States on 3 March 1944 for plastic correction of his skull defects and improvement in the scars in his scalp. From a letter to the author written 5 April 1944 the patient seemed in excellent condition and entirely without functional residua.

From the beginning this patient presented problems, all of which arose from unavoidable delay in reaching the casualty clearing station where definitive treatment might have been carried out. Since it was already too late to intervene surgically, the early care of this patient became nonsurgical. A gratifying end result was achieved in spite of adverse circumstances.

CASE 4. A man injured on 13 January 1944 by a penetrating gunshot wound of the left parietal region, was operated on in a hospital company on the beachhead. All bony fragments and the foreign body were removed. The position and depth of the latter were not specified. It was not possible to close the dura, but the scalp was closed in layers without drainage. No other notes accompanied the patient.

He was received in our hospital on 19 January 1944, conscious, alert, unable to talk, with obvious weakness of the right hand and face. The scalp over the wound was bulging and tense, but the sutures had been removed and it was healing per primam. His temperature did not indicate infection, but he was started on a sulfonamide course as a prophylactic measure and a dehydration regimen was instituted. Fluid intake was limited to two liters per twenty-four hours and he was placed in a head-up bed of the MacLean type. X-rays showed a 4 by 2 cm. defect in the left parietal area. No bony fragments were seen. By 23 January his speech was returning, the weakness in his right arm and face was nearly gone, and the wound was nearly flat. Pulsations in the scalp over the defect were perceptible. On 27 January a few small stitch abscesses were noted centering around several of the galeal sutures. The involved sutures were removed, and cultures revealed a hemolytic *Staphylococcus aureus*. On 3 February he was ambulatory, speech was almost normal, and power in his right hand and face nearly equaled that on the left. There were still two tiny foci of infection along the wound but not extensive enough to require a dressing. These had cleared almost completely by 15 February when he was evacuated to the rear.

Well-performed early surgery made this patient ambulatory in eighteen days, less than one-quarter the time required for patients who did not have early débridement and closure. Neither did he suffer from headache and vertigo with mild activity as is frequently the case in patients who have an open brain wound for days or weeks.

CASE 5. A man received a penetrating wound of the brain in the left parietal region during an air raid on 16 February 1944. A fragment of an aerial bomb was retained. He was taken as rapidly as possible to a forward evacuation hospital where it was noted that he had a flaccid paralysis of the right arm, was stuporous, and already had herniation of brain tissue through the wound. He received two units of plasma and underwent a craniotomy through a tripod incision at the site of the wound (figure 4). Clotted blood and devitalized brain and bone fragments were removed. The wound was closed tightly without drainage. Two days later his condition was good—he being able to move both arms, hands, and legs, though

he was unable to talk and the right side was still weak. A lumbar puncture showed the cerebrospinal fluid to be bloody and under increased pressure, but the next day it was less bloody and under normal pressure. He began to talk on that day but there was an aphasic defect. On the fourth day, the wound was healing well, was not bulging, and was showing slight transmitted pulsation. On the eighth day the sutures were removed; the wound healed. He was received in our unit in excellent condition on 26 February 1944, the tenth day after injury, but still had moderate weakness and apraxia of the right arm and hand, and an aphasia which was almost purely motor, though this defect gradually cleared. X-ray showed an operative defect in the left parietal bone. A retained foreign body, 3 by 4 mm., was present near the left frontal pole of the brain. He was evacuated to the rear on 26 March 1944 as an ambulatory patient. Again, as in case 4, early and adequate surgery made the patient ambulatory in less than a month from the date of injury.

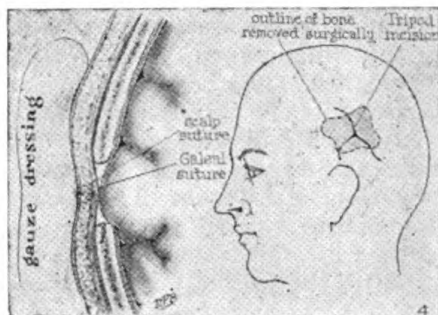


FIGURE 4. (Case 5) Condition of the wound on admission. Adequate, early surgery secured primary healing uncomplicated by hernia cerebri.

CASE 6. A man on 12 March 1944 received a grazing type of gunshot wound of the scalp and skull with depression of bone fragments and exposure of brain, near the vertex of the skull (figure 5). His only neurological abnormality was a paralysis of both feet and ankles. In a forward installation a superficial débridement was done. To minimize cerebral herniation, the exposed brain had been covered with petrolatum gauze and then by a firm gauze pack fitted closely into the scalp wound and held in place by tension sutures crossing over it. On arrival at our unit on 15 March the sutures and packing were removed and several depressed bone fragments were extracted. The wound was otherwise clean. At the suggestion of another neurological surgeon who had been using penicillin powder directly on extruded brain tissue, 100,000 units of penicillin were sprinkled into the wound. At the next dressing the granulation tissue along the scalp edges appeared unusually clean and firm and there was very little drainage. On 20 March a soft rubber tube perforated at its tip was placed in the wound and covered by a thick dressing, and through

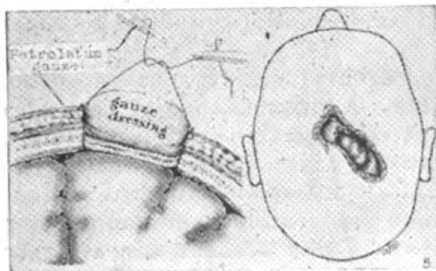


FIGURE 5. (Case 6) Gutter type wound of skull and brain. A carefully fitted pack had prevented hernia cerebri prior to arrival in our unit. No complications resulted from use of pack, although such a procedure is not without danger.

which 12,500 units of penicillin in 5 cc. of distilled water were injected every three hours until 200,000 units had been used. A secondary closure was intended when this treatment was completed, but opportunity for surface evacuation presented itself and the patient was evacuated on 26 March. He arrived at the rear hospital in good condition, with no hernia cerebri and with returning power in both feet. This case suggests one method which a forward area surgeon pressed for time might use to control cerebral herniation. Since the use of such a pack is not without danger, it must be used cautiously. The pack must be accurately fitted to the



scalp defect to prevent the brain squeezing around it. Pressure must not be exerted below the level of the skull. The pack must not be left so long it interferes with drainage, and attention should be directed to the presence of the pack by prominent marking on the medical tag.

#### DISCUSSION

Early recovery and return to duty can be achieved in patients with compound injuries of the brain only by strict adherence to efforts designed to prevent infection and further damage to the brain. Herein lies the need for and importance of early definitive surgery. The surgical method of dealing with this sort of injury is illustrated on the opposite page. The fundamental principle in preventing infection is the attainment of a clean wound. This involves trimming of the skin edges, removal of damaged bone, and careful cleansing and débridement by means of suction and irrigation of the tract in the parenchyma of the brain. Flotation and suction should remove dirt, hair, clots, small bone fragments, and tissue debris from the tract.

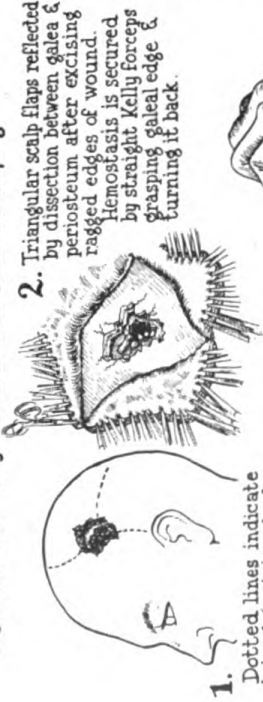
With the wound properly cleansed, the second factor in avoiding infection (that is, leaving a dry wound) demands attention. Hemostasis must be adequately secured to prevent the formation of blood clots which may later become infected or which if uninfected may give rise to a chemical aseptic meningitis. The use of bacteriostatic agents in the wound should be confined to a light frosting—not a heavy packing. Sulfanilamide crystals in small quantities have been shown to produce a low-grade stimulation of fibrous and glial tissue, but the value of this drug as a bacteriostatic agent in the wound probably overcomes its tendency to increase scarring. The use of other sulfonamides in the wound is not considered wise since experimental evidence suggests that they may produce an epileptogenic focus. Sulfathiazole in particular is dangerous for this reason. The postoperative oral administration of sulfonamides is a valuable adjunct in controlling infection but it does not display properly performed surgery, particularly since our experience has shown that during the evacuation of patients from forward areas administration of these agents is at best spotty. The value of general supportive measures (e. g., maintenance of an adequate diet and vitamin intake) in controlling an infectious process must not be overlooked.

An adequate effort to decrease the likelihood of infection is shown in cases 2, 4, and 5, but case 2 demonstrates in particular the undesirable results of an incomplete operative procedure. Under such circumstances cerebral herniation is the inevitable result. Cases 4 and 5, on the other hand, benefited by completion of the surgical procedure which was directed toward preventing cerebral herniation and its attendant potential increase in brain damage.

To reduce the likelihood of increased cerebral injury, closure of the dura should be carried out if it is possible. Approximation of the dura covers the brain and to a certain extent it reduces the scarring between scalp and brain that occurs in the presence of a skull defect. The scalp should be closed over the exposed brain if at all possible. Thus, the danger of further protrusion is greatly reduced and a moderately firm compression dressing over the wound enhances this effect. Cases 4 and 5 are evidence in favor of such a procedure. In both patients, complications were at a minimum, ambulant convalescence was established four to six weeks earlier than in the other patients, and an earlier return to useful military or civilian activities could reasonably be anticipated.

If the scalp closure cannot be effected, definite effort to prevent cerebral herniation must be made, or to reduce it if it is already present. Case 6 illustrates a rather effective method of obviating herniation, which, how-

**TECHNIQUE FOR DEBRIDEMENT AND PRIMARY SUTURE OF PENETRATING WOUND OF THE HEAD - with foreign body retained indriven bone fragments and early cerebral herniation developing.**

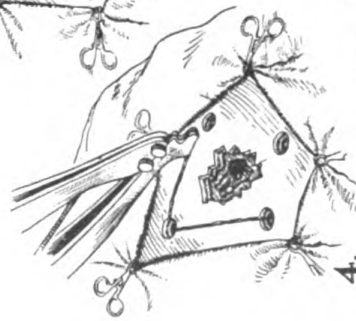


**1.** Dotted lines indicate tripod incision to be made in scalp centering on penetrating wound.

**2.** Triangular scalp flaps reflected by dissection between galea & periosteum after excising ragged edges of wound. Hemostasis is secured by straight Kelly forceps grasping galeal edge & turning it back.



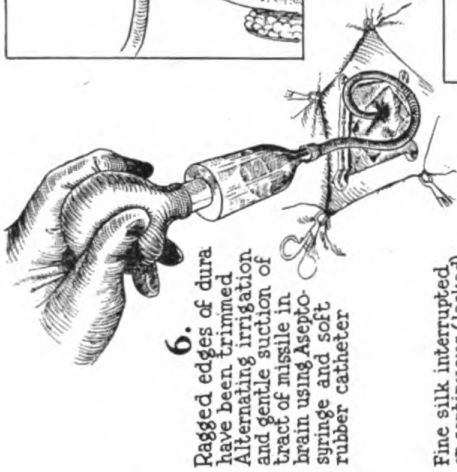
**3.** Scalp flaps covered by sterile towels. Four holes drilled at corners of a square around skull defect.



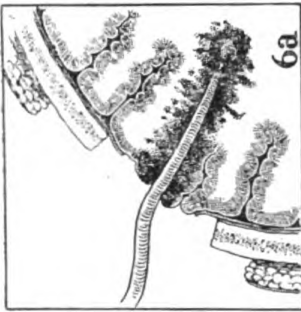
**4.** Using deVilbiss line-cutting rongeur, burr-holes are connected preparatory to elevating enclosed bone flap.



**5.** Bone flap elevated. Loose fragments not driven into brain removed.

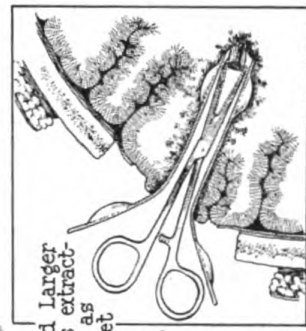


**6.** Ragged edges of dura have been trimmed. Alternating irrigation and gentle suction of tract of missile in brain using Asepto-syringe and soft rubber catheter.

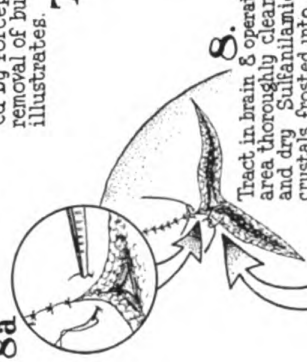


**6a**  
Section showing catheter in tract. Flotation and suction remove dirt, hair, devitalized brain and small bone fragments.

**8a**  
Fine silk interrupted or continuous (locked) suture used to approximate scalp edges.



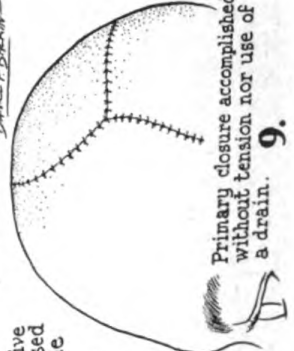
**7.** Tract cleansed. Larger bone fragments extracted by forceps as removal of bullet illustrates.



**8.** Tract in brain & operative area thoroughly cleansed and dry. Sulfanilamide crystals frosted into tract and wound. Scalp flaps turned into position and primary closure begun.



**8b**  
Fine silk interrupted sutures used to approximate proximate galeal edges.



**9.** Primary closure accomplished without tension nor use of a drain.

ever, is not without danger (figure 5). It is applicable only to a specialized situation which arises when such a patient *must* be evacuated and when the time required for transit of the patient to a neurological surgeon will be short. Such packing should not be long left in place, since to do so defeats its purpose by interfering with drainage.

The prevention of further damage to the brain involves not only the avoidance of cerebral herniation; other factors which may cause immediate extension of the brain injury are hemorrhage and too extensive débride-ment of the brain. In involvement of the so-called "silent" areas of the brain, an increase in the size of the damaged area may produce no demonstrable neurological or mental changes, but the fundamental principles of conservation should nonetheless apply. The methods of dealing with hemorrhage are common knowledge. The extrusion of brain on the other hand presents the surgeon with a more involved problem. The use of drastic intravenous dehydrating agents (hypertonic plasma, hypertonic glucose, or sucrose) at the time of surgery was not observed in the series, and it is probably to the patient's advantage that none was used. Too rapid dehydration and reduction of the extruded brain introduces the danger of opening up the subarachnoid spaces around the wound, thereby allowing the irrigating fluid to carry dirt or organisms into the cerebrospinal fluid with consequent danger of meningitis.

Under no circumstance should the hernia be amputated, since it is not all dead tissue and its removal will increase brain damage; furthermore, the amputation of such a mass of tissue usually is followed by the extrusion of more brain.

The causes of delayed brain damage are infection (localized encephalitis, brain abscess, meningitis) and extensive scarring. Scarring will be more extensive if foreign material and devitalized tissue are not removed. It will also be increased if there is undue probing of undamaged brain tissue. It can be minimized by removal of brain adjacent to the wound to the nearest convolutional fold. While it is imperative to remove hair, cloth, dirt, and devitalized brain and bone, metallic foreign bodies should be removed only if this can be accomplished without further injury to normal brain. If such foreign body later becomes infected, its removal will be required as it was in case 3. Extensive scarring entails those risks associated with a contracting lesion of the brain—focal epilepsy and functional interference with cortex and conduction pathways. Such scarring can be minimized by avoiding infection no matter how low-grade and by leaving a surgically clean wound.

Surgeons in the forward area are presented with other problems in this type of injury. Foremost of these is probably the question as to how far along the outlined course the surgical treatment of an individual case should go. Ideally, a patient suffering from a compound head injury should receive complete definitive treatment at the earliest possible moment. Since experience has shown that such a patient travels better before than soon after surgical intervention, if the operative treatment is begun, it should be completed and the patient held until able to travel. If a complete surgical procedure cannot be done, he should receive a very high priority on the evacuation schedule, and if evacuated by aircraft, to avoid protrusion of the brain, he should preferably be subjected to not more than a 4,000-foot increase in altitude.

When the patient does not reach the first surgical installation before the end of twenty-four or thirty-six hours and when large hernia cerebri is already present, as was observed in case 3, the basic principles of treatment remain the same but follow nonsurgical rather than operative lines. In other words, infection and further damage to the brain must still be

minimized, but the cerebral hernia must be reduced before operative intervention can hope to be successful. When hernia cerebri is already established, it can best be reduced by methods such as were used in cases 2 and 3—the use of a head-up bed and dehydration through limitation of fluids (in our tropical climate 2,000 cc. per twenty-four hours was an effective maximum daily intake); however, if sulfonamides are being administered, the urine must be carefully checked for crystallization of the drug under reduced fluid intake. Posturing by means of elevation of the head in a head-up bed is important, as it tends to decrease intracranial pressure through hydrostatic principles. Spinal punctures have not been used for this purpose in this series.

In sedating a head-injured patient, it is usually unwise to use morphine since it interferes with pupillary signs, tends to mask coma and other neurological signs, and is in synergy with the increased intracranial pressure in decreasing the respiratory rate occasionally even to the point of causing death. Restlessness is usually indicative of an elevated intracranial pressure and is most safely controlled by relieving its cause. When sedation is needed, it is better to use phenobarbital, chloral hydrate, or paraldehyde. The milder analgesics, aspirin and phenacetin and occasionally codeine, usually suffice for the control of the associated headache or pain. If morphine is used, it should be used in small doses ( $\frac{1}{8}$  gr.) and repeated infrequently.

Shock is not a large problem in head injuries. The use of plasma or whole blood is preferable to saline solutions since the former have much less tendency to increase intracranial pressure. The head should not be lowered in treating shock since this position increases intracranial congestion and hemorrhage and raises the pressure through simple dynamics. It is for better to keep the patient level or even slightly to elevate the head since the latter position improves the cerebral circulation by reducing venous congestion.

#### SUMMARY

An experience of two years in the treatment of casualties suffering compound craniocerebral injuries has shown a variance of surgical approaches to the care of such patients. The end results have been surprisingly favorable. Those patients given early, complete, definitive surgical treatment have recovered most rapidly and with the least residual demonstrable loss of function. The problems arising from incomplete or no early surgical intervention have been discussed, and an argument in behalf of prompt application of neurosurgical principles has been presented. By close adherence to these principles the greatest benefit to the patient may be achieved. Early recovery with minimal residual neurological or mental changes follows, and the patient in most cases may reasonably be expected to return promptly to active military or civil life.

**Scientific Honesty.**—The man who is more anxious to prove that he is right than to find the truth will nearly always arrive at a conclusion in accordance with his wishes. His observational values will be shaded, without intentional deceit, to agree with preconceived ideas, and he may even see things that are not there. A deeply grooved habit of scientific honesty, of facing the facts impartially, is more important than knowledge to a research worker. (Selection and Training of Students for Industrial Research, by Dr. Albert W. Hull, Research Laboratory, General Electric Company, *Science*, 16 February 1945)



# Treatment of Skin Diseases in the Tropics

CAPTAIN THOMAS W. CLARK

Medical Corps, Army of the United States

The skin diseases most commonly encountered in an Army hospital which was for more than a year and a half in the South and Southwest Pacific were epidermophytosis, dermatitis venenata, and the bites of insects and mites. The characteristics of these conditions were much the same as in temperate zones but they tended to be more persistent and more severe. Secondary infection complicated nearly every case, and most often it was the infection and not the primary disease that led to hospitalization.

Difficult living conditions, a hot climate, and lack of appetizing food reduced men's stamina and resistance to infection. Not uncommonly a chronic ulcer started as a trivial scratch or cellulitis as a simple fissure. Rest, clean surroundings, well-prepared foods, and full doses of vitamins were essential parts of the treatment. These patients did far better in a dry, flyproof building where cleanliness, asepsis, and nursing care were easier to attend to than in the ordinary ward tent as set up in the field. Nevertheless, when only a ward tent was available, every effort was made to approximate the conditions in the better installation.

The therapy outlined here is not original but consists of measures proved satisfactory by experience in the tropics. Invaluable aid was obtained from the *Manual of Dermatology*.<sup>1</sup>

## EPIDERMOPHYTOSIS

Epidermophytosis was one of the most persistent conditions encountered. It incapacitated our men despite all efforts with soap and water, boiled socks, and foot powder, and it was frequently advanced and secondarily infected by the time they reached the hospital. Overtreatment was the most common error. Strong solutions and strong ointments irritated an already damaged skin. The tendency to adopt a routine course of treatment was the reason why many cases of "athlete's foot" failed to improve. Treatment had to be individualized, cautious, and guided by the character and progress of the disease.

The acute stage with fissures, vesicles, broken blisters, and denuded areas between the toes and under the feet was generally complicated by secondary infection. First and foremost in treatment was the control of the secondary infection. The patient was put at complete bed rest. The diseased areas were gently débrided of all loose epidermis and the tops removed from the large

Published in Medical Clinics of North America, November 1944, pp. 1532-1540. Philadelphia: W.B. Saunders Co.

1. Pillsbury, D. M., Sulzberger, M. B., and Livingood, C. S.: *Manual of Dermatology*, 421 pp. Philadelphia: W. B. Saunders Company, 1942.

blisters every day. The feet were cleaned with a mild sterile soap solution. Warm soaks in a weak fungicidal solution were started. Potassium permanganate was usually available, and a solution of 1 to 8,000 (0.30 gm. in 3,000 cc.) was quite strong enough. Three times a day the feet were soaked for twenty minutes and then dried. If the disease was widespread or if there was extensive secondary infection, continuous warm compresses of the same solution were a better method of application. Between soaks, the feet were left uncovered. In cases with extensive weeping, the feet were exposed to dry heat under a cradle or in the sunlight to dry the skin and prevent maceration. When there were blisters or fissures between the toes, the opposing surfaces were separated with sterile powdered gauze to prevent maceration of the skin. It was often desirable to put light sterile dressings over the affected areas during the night.

In many cases the secondary infection disappeared and the original fungus infection subsided after two to four days of rest and soaks. The feet were kept clean and dry with foot powder and the patient watched until desquamation was complete and all evidences of activity had disappeared. More often, the secondary infection subsided and the vesicles and blisters of the acute epidermophytosis were replaced by patches of thickened epidermis with scaling and oozing under the patches. A few more days of soaks with potassium permanganate solution sometimes controlled this condition. If no more improvement occurred within this time, one of the dyes in solution, such as Castellani's paint\* or 2 percent gentian violet in 70 percent alcohol, was applied. Fraser's solution\*\* or tincture of iodine was also effective at this stage. It was found best to start off with one-quarter to one-half strength solutions and to increase slowly until the full strength was applied twice daily. If any evidence of irritation appeared, the medications were stopped.

Most cases cleared up entirely with potassium permanganate soaks alone or with the soaks followed by one of the medications mentioned. A few went into a chronic stage characterized by thickened plaques of epidermis, scaling, and fissuring, which lesions resisted treatment, relapsed time after time, and were likely to flare up acutely when irritated. Solutions containing from 1 percent to 7 percent iodine often yielded good results when painted on the lesions twice a day. If there was no improvement with iodine, within two weeks,

*Castellani's paint:		Gm. or cc.
Saturated alcoholic solution basic fuchsin		10.0
Aqueous solution phenol, 5%		100.0
Filter and add:		
Boric acid		1.0
After two hours, add:		
Acetone		5.0
After two hours, add:		
Rescorcin		10.0
Keep in dark, stoppered bottle.		
**Fraser's solution:	Gm. or cc.	
Salicylic acid	2.0	
Benzoic acid	2.0	
Tincture of iodine	10.0	
Spirits camphor to make	60.0	

or if iodine irritated the lesions, Castellani's paint or Whitfield's ointment was tried. Many weeks of continuous treatment were sometimes necessary to heal the lesions completely.

While ointments were valuable at times, they are best avoided in the tropics as they favor the spread of secondary infection when applied over contaminated lesions. Whitfield's ointment was valuable for softening the dry, scaling epidermis of the subacute and chronic stages. It was rubbed into the lesions thoroughly and no dressings were used. It was never used in the acute stage or when secondary infection was present. Treatment with this ointment was started with quarter-to half-strength mixtures and gradually worked up to full strength to avoid irritation. Sulfur ointment was of no value in this disease. Ammoniated mercury was mildly antiseptic but relatively ineffective.

Dermatophytides on the hands and ears were common complications of epidermophytosis of the feet or groin. They were characterized by vesicles, scaling eczematoid patches, fissures, and varying degrees of erythema and were very similar to other dermatoses. They were often far more prominent than the primary lesion. The commonest error was to overlook the primary lesion on the foot or the groin and to mistake the id for a separate disease. As the uncomplicated id will heal only when the primary disease is cured, it was important to look for epidermophytosis elsewhere on the body and to treat it as has been described. The ids were treated symptomatically with mild medications. Potassium permanganate soaks were useful for drying up the oozing from broken vesicles. When there was much scaling and fissuring present, boric acid ointment or petrolatum was used to soften the lesions. When secondary infection was present, it was treated as previously described.

After the disease had been controlled and the patient was ready for duty, he was instructed in the care of his feet with emphasis on the use of soap and water and foot powder. His shoes were fumigated by placing them in an airtight container for twenty-four hours with a sponge soaked in 30 percent formaldehyde after which the shoes were aired for twenty-four hours in the sunlight. The soldier was told that there might be recurrences and that at the first sign of renewed activity he should report for treatment.

#### DERMATITIS VENENATA

Leaves and barks of tropical plants and trees irritate the skin, the irritations varying from momentary burning and reddening to the severe forms of dermatitis in which all layers of the skin become damaged. Secondary infection usually occurred unless care was taken to avoid contamination. Itching was usually intense. Treatment demanded all ingenuity at our command. The following case serves as an example of the difficulties encountered.

## CASE REPORT

A Marine Corps private developed burning and itching on the left wrist following contact with the black sap of the "Wannarla" tree and vesicles soon developed over the involved part. He was treated as an ambulatory patient for nine days. First, calamine lotion was applied, then tannic acid ointment, then salicylic acid ointment. The disease became worse and spread to the right hand. He was admitted to sick bay and treated with continuous soaks of potassium permanganate solution of unknown strength. Blebs, tenderness, and swelling rapidly developed on both hands; then two weeks after onset he was sent to the hospital.



FIGURE 1. Appearance on admission to hospital. The discoloration was due to potassium permanganate soaks applied before admission. Blebs filled with pus and shreds of epithelium can be seen on the palms and fingers.

On admission, the backs of the hands and wrists were covered with vesicles and blebs, many of which were broken. Large areas were denuded of epithelium and were covered with shreds of epidermis and pus. The surrounding tissues were swollen and red, and the axillary and epitrochlear lymph nodes were enlarged and tender. There was no fever, although pyoderma and cellulitis had clearly become superimposed on the dermatitis.

A strict aseptic regimen was imposed. The hands were débrided of loose epidermis and crusts, the tops removed from the larger blisters, the skin cleaned with sterile solutions, and continuous warm saline compresses



applied. Sulfathiazole was given by mouth, two grams at once and one gram every four hours. The involved parts had become distinctly cleaner in twenty-four hours. Crusts and loose epidermis were carefully cleared away. The compresses were reduced to one hour twice a day, sulfadiazine ointment was smeared over the lesions after the compresses were removed, and all lesions were covered with sterile gauze bandages. This treatment was continued on both hands for five days, at the end of which time only a few islands of infection remained. The sulfonamides were discontinued and 2 percent gentian violet in 70 percent alcohol was painted over the hands and forearms. In a short time several infected areas flared up. The gentian violet was stopped and warm compresses followed by sulfadiazine ointment were started again. In three more days, all evidence of infection disappeared. Scattered spots which continued to weep clear serum were touched with gentian violet every day until they healed. New epithelium grew over the denuded areas and in twenty-six days after admission, the patient was discharged to duty.

In patients such as the one described, the condition of the skin was similar in many ways to a first- or second-degree burn, and the same principles of treatment were followed. Sterile instruments for débriding, sterile solutions for washing, sterile ointments and gauze for dressings all were essential in this work. From the start, the diseased areas were protected with sterile coverings. First, the lesions were carefully débrided of all crusts and loose epidermis. The tops of blisters were removed. The involved areas were cleaned with green soap, sterile water, and alcohol and then covered thinly with sterile ointment. Boric acid ointment and petrolatum were satisfactory for this purpose. A good method for applying these medications is to impregnate autoclaved gauze with the ointment. The ointment helped protect the damaged skin from infection and soothed the burning and itching that caused great distress.

Secondary infection, when present, was treated promptly. If it was a simple superficial infection, the above regimen usually controlled it. A sulfonamide was sometimes added to the protective ointment. Five percent sulfadiazine in a water-soluble base\* was frequently used and was excellent. If a widespread pyoderma had developed with an underlying cellulitis and fever, the lesions were carefully débrided and cleaned as before. Warm saline compresses were applied for an hour every four to six hours. Between soaks, the lesions were covered with dry sterile dressings. When the dressings were removed, they were soaked off in order not to damage any regenerating epithelium. Compresses were continued until the infection was well controlled; twenty-four to thirty-six hours were usually sufficient. Then ointment and gauze dressings were applied as described. As long as oozing and crusting lesions were present, they were covered to avoid recurrence of infection.

\*Water soluble bases:

1. Aquaphor.
2. Hydrogenated vegetable fat.

Other ointment bases may be found in the Manual of Dermatology.<sup>1</sup>



The more severe cases required sulfathiazole or sulfadiazine by mouth. The usual course prescribed for each drug was two grams at once, one gram every four hours for forty-eight hours, and then one gram four times a day until the infection improved. Sodium bicarbonate was given in equal amounts with each dose of the sulfonamide. At the first sign of an untoward reaction the drugs were stopped.

While both tannic acid and gentian violet were used in the case described, they are not recommended in this disease. The eschar may seal over an area of secondary infection and encourage its spread. The eschar had no effect on the course of the disease and the protection it afforded could have been given better and more safely with a bland ointment and bandages.

Itching was difficult to control and scratching was an important source of secondary infection. In milder cases where there was little excoriation of the skin, the lesions were treated frequently with antipruritic lotion and covered with sterile dressings for protection. A clean and effective lotion was the following:

	Gm. or cc.
Phenol	2.0
Glycerine	15.0
Limewater	120.0

Ointments were also soothing and helpful against itching. Even more effective in some patients than the lotions and the ointments were phenobarbital, aspirin, and codeine, which were used freely.

Cornstarch and oatmeal baths were used for a few patients with extensive dry exfoliating lesions on the trunk and thighs to relieve the intense itching. Baths were never used in the presence of secondary infection. One-half to one pound of cornstarch was ample for a forty-gallon tub of water. Warm baths were better tolerated than cold. Even in a hot climate patients became chilly if left in the tub over thirty minutes. It was found best to limit the procedure to from twenty to thirty minutes and to repeat it two or three times a day.

#### INSECT AND MITE BITES

Fleas, mites, and mosquitoes were present in great numbers. Mite bites on the ankles and legs were particularly troublesome. Secondary infections from scratching these lesions were common and often required hospitalization.

Measures to prevent bites were taken when possible. Orders were issued to apply insect repellents liberally over exposed parts. Smeared frequently over the ankles and legs, "612"\* was very effective against mite bites. Sulfur preparations did not prove so satisfactory. Protective clothing was ordered to be worn at all times. Beds were aired and sprayed

\*This repellent is no longer issued. It has been replaced by repellent, insect, stock No. 51-R-265, which contains, in part, formula 612 and is considered superior in its effectiveness against mites (chiggers).

frequently. These measures did not eliminate the bites but they reduced the number.

The treatment of bites was aimed to relieve the itching and to reduce scratching. Antipruritic lotions and pastes were helpful though messy, and their effects passed off in about an hour. Nevertheless, they were well worth trying when an individual was suffering. The following lotion<sup>1</sup> proved very useful:

	Gm. or cc.		Gm. or cc.
Zinc oxide	25.0	Camphor	5.0
Talc	25.0	Menthol	0.5
Bentonite or kaolin	5.0	Water	30.0
		Alcohol, 95 %	30.0

With some persons who could not control scratching, it was necessary to cover the bites with a protective bandage.

Scratch infections were common and extremely resistant to treatment. They varied from small pustules to furuncles and ulcers. If the lesions did not heal after a week of dispensary care, the patient was hospitalized. They required the same care described for other secondary infections. The patient was put to bed, and the lesions and surrounding skin were cleansed well with green soap, sterile water, and alcohol. If the infection was severe, with surrounding cellulitis, continuous hot saline compresses were applied for about twenty-four hours, after which the lesions were covered with a sterile ointment or gauze impregnated with an ointment. Sulfadiazine in a water-soluble base, boric acid ointment, or plain petrolatum were all satisfactory. The use of adhesive tape on the skin was avoided as it favored the development of satellite lesions. If no improvement occurred in a week with this treatment, a full course of sulfadiazine or sulfathiazole was given by mouth. Experience showed that these infections once established tended to persist indefinitely even in the milder forms until the patient was put to bed and the lesions protected from dirt and trauma.

#### X-RAY

Facilities for x-ray therapy were limited. It was used most often in chronic forms of epidermophytosis. The results were disappointing, although it was effective against the secondary infections that complicated this condition. As secondary infections could be managed by less risky methods, the x-ray was not considered for routine treatment.

#### CONCLUSION

The skin diseases most commonly found in soldiers on duty in the tropics were epidermophytosis, dermatitis venenata, and the bites of insects and mites. Secondary infections sometimes complicated these conditions and caused prolonged hospitalization. Strong and irritating medications often aggravated the acute process. Good general care, strict adherence to aseptic surgical techniques, and the judicious use of local therapy were the important factors in treatment.

## Tourniquet Problems in War Injuries

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The intelligent handling of tourniquets in war injuries of the extremities is a phase of war surgery that has been considerably neglected. The whole tourniquet question too often has been lightheartedly dismissed with the dictum, "Release tourniquets every twenty minutes to one-half hour," whereas, the problem requires thought and sound judgment. Tourniquets are frequently applied unnecessarily, but the rule of releasing tourniquets every one-half hour to "prevent gangrene" is extremely dangerous in many instances.

Each case requiring a tourniquet is an individual problem, not only if one is confronted with the patient initially, but also if the patient is seen with a tourniquet already applied. Only by careful, but often necessarily speedy, evaluation of the patient's blood loss, the state of shock, the facilities available for blood volume replacement therapy, the time interval likely to elapse before primary surgery can be done, and the extent of the damage to the extremity, can one arrive at a proper decision about the application or removal of tourniquets. It is of some concern that so little stress has been placed on this fundamental life- and limb-saving device.

During the past year on the Italian front, we have been actively engaged as a general surgical team of an auxiliary surgical group, functioning in "first priority" surgical hospitals. This type of hospital (a field hospital unit) is in physical conjunction with the division clearing station and accepts all extremity wounds in which shock is present and all cases which have tourniquets applied. We have seen a large number of this type of case, not only those admitted to our service, but those admitted to the service of the other teams with whom we worked.

Early in the Italian Campaign, the following questions caused the most concern:

1. What is an adequate tourniquet, and how is it best applied?
2. Should a tourniquet be applied early in a severe extremity wound, or should one wait for the spontaneous cessation of hemorrhage?

3. How long is it safe to leave a tourniquet applied, and how often is damage caused by tourniquets?

4. How are tourniquets best handled in patients who are in shock from blood loss?

5. Should tourniquets be applied to extremities in which external bleeding is minimal, but in which there is progressive and pronounced hematoma formation?

6. What is the role of temperature with regard to the handling of tourniquets?

After a year of service in the most forward surgical hospitals, we have seen enough cases presenting these problems to form opinions and gain impressions, some of which are at variance with accepted practices. These views are in general agreement with those of other general surgical teams having had similar experiences.

#### AN ADEQUATE TOURNIQUET

The term "adequate tourniquet" requires clarification. Complete control of bleeding is the primary aim of tourniquet application, and any procedure short of this is considered inadequate. We believe that the strap-and-buckle type tourniquet in common use is ineffective in most instances under field conditions, and recommend that it be discarded, substituting a soft-rubber-tubing tourniquet. The strap-and-buckle tourniquet is too narrow and cuts into the tissues, and it rarely completely controls bleeding, no matter how tightly applied. This circumstance, which has been observed repeatedly, possibly can be accounted for on the basis of the customary practice of placing a gauze roll or other firm object over the course of the vessels and securing the tourniquet over it. The vessels tend to slip out from under this firm object, or, if the principal vessels are occluded, the firm object elevates the tourniquet on either side so that no pressure whatsoever is exerted on the collaterals running parallel to the main vessels. Where the strap-and-buckle must be used, the substitution of mechanic's waste or a Carlisle dressing for a pad or using no pad whatsoever seems more logical. The ideal tourniquet is one of a pneumatic type, in which the pressure can be accurately adjusted and maintained. This type has the inherent danger of pressure leakage and is not feasible for combat zones because it is relatively cumbersome and complicated.

The simplest and most effective device for a tourniquet, in our experience, is one of soft-rubber tubing properly applied, the  $\frac{1}{2}$ -inch soft-rubber tubing, Medical Supply Catalog Item No. 3879000. This tubing should be at least 6 feet long. Our procedure is to pad the extremity with a towel, a shirt sleeve, trouser leg, or any other material available, at the level at which the tourniquet is to be applied. Four parallel turns of the rubber tubing are wound around the leg under moderate

tension only, the end first applied being overlapped and anchored by the second turn, and the last turn being anchored by the next to the last turn. Most rubber-tubing tourniquets are applied too tightly; actually, if several turns are used, only moderate tension is required completely to occlude all vessels. If  $\frac{1}{2}$ -inch tubing is not available, the  $\frac{1}{4}$ -inch soft-rubber tubing (Med. Dept. Item No. 3878000) is a satisfactory substitute. More turns are necessary, however; eight or ten turns on the thigh are desirable, and four or five on the arm.

A tourniquet should be placed as close to the site of injury in the thigh or arm as is feasible. If large defects are present in the extremity, care must be taken that the tourniquet is placed sufficiently above the injury to prevent the tourniquet from slipping down into the defect. Tourniquets about the forearm or leg are of dubious effectiveness, since bleeding from the incompressible interosseous vessels may continue to lead to a considerable loss of blood.

#### WHEN TO APPLY A TOURNIQUET

Many severe wounds of extremities, especially badly contused or avulsed wounds not involving major blood vessels, require no tourniquet. An inadequate tourniquet may actually increase bleeding from this type of wound. Yet the impression we have gained on the Italian front is that tourniquets have not been used sufficiently nor early enough in serious extremity wounds, particularly in wounds involving large blood vessels or in patients with traumatic amputations. There may be some bias attached to this observation, since the only patients admitted to field hospitals were those in shock or those having tourniquets. Yet certainly in this particular group, many were seen who undoubtedly could have been benefited by the early application of a tourniquet. Statistics are not available to show what percent of wounded bleed to death on the battlefield from extremity wounds, nor is it known how many succumb from hemorrhage after receiving first-aid treatment. It seems probable that some do, although the proportion may be small. We do know that many patients with extremity wounds are seen in field hospitals with no tourniquets applied. These patients have lost more blood than conditions would seem to warrant. Blood volume and blood count studies preoperatively and postoperatively indicate that, on the whole, these patients had often lost from 33 to 50 percent of circulating blood volume.

In most of the patients we have seen with severe wounds of an extremity, bleeding had stopped by the time they reached the field hospital, usually from six to eight hours after wounding. This apparently does not occur so readily as some authors would lead us to believe, since the general condition of the patient is often critical from blood loss. It would seem that spontaneous arrest of hemorrhage frequently does not take place until the systemic pressure has fallen and sufficient spasm has



developed in the vessels to effect cessation of flow. This, in our opinion, is a somewhat dangerous method to rely on to control hemorrhage. The following case is illustrative:

A sergeant was seen immediately on admission to a field hospital. A shell fragment had perforated his left arm at about the middle third five hours prior to admission. No other wounds were present. He was extremely pale, restless, and apprehensive, although his initial blood pressure was 115/60. His pulse rate, taken by carotid artery, was 128. He had obviously lost a large quantity of blood. Generalized vasoconstriction was intense. Examination of the wound showed no bleeding whatsoever at the time. Cross-matching of his blood was started, but within ten minutes of admission his general condition began to deteriorate rapidly, the blood pressure dropping to 72/40. A transfusion of low titer "O" blood was immediately started, the blood being forced in rapidly under pressure. He received about 300 cc. of blood during the ensuing fifteen minutes, in spite of which death occurred twenty-five minutes after admission. A careful, complete autopsy was performed. The only finding of significance was a perforating wound of the left mid-arm which produced transection of the brachial artery (which showed no evidence of an intralumen clot), and a compound comminuted fracture of the left humerus. No symptoms suggestive of fat embolism were present before death, and no signs of this process were seen at autopsy. A diagnosis of death from hemorrhagic shock was made.

The circumstances preceding the admission of this case are not known and there is a variety of possible reasons why this man had no tourniquet applied. No criticism is implied in making the statement that had it been feasible to apply a tourniquet before an excessive hemorrhage had developed, the regrettable sequela would, in all likelihood, not have occurred.

We are convinced that an adequate tourniquet should be placed, at the earliest possible moment, proximal to any extremity wound that is bleeding freely. Many of the fears of damage from tourniquets are probably unfounded to a large extent, and certainly the saving of each possible ounce of blood is desirable from the standpoint of the patient's general condition.

#### THE TIME FACTOR

Fear of possible damage to an extremity from a tourniquet seems based on no reasonable grounds. The greatest fear is exhibited regarding "gangrene" of an extremity. Unquestionably an extremity will become gangrenous if a tourniquet is left on an excessive length of time, but in our experience, a tourniquet may be left on from two to six hours, depending on the temperature of the atmosphere and of the extremity, without clinically detectable damage. We have seen tourniquets left on as long as eight hours, during the winter of 1943-44, without apparent deleterious effect. Tourniquets applied four to six hours without loosening have been observed on several occasions. The surgeons of an auxiliary surgical group have performed amputations on about 1,000 patients in forward hospitals. These surgeons have all seen extremities on which tourniquets have been left applied up to four hours; yet no case of gangrene solely from a tourniquet has been noted, as

far as we have been able to determine. It is conceded that the tourniquets may have been a factor in the production of gangrene in some cases of extensive vascular injury, but the importance of this factor is a debatable point. Even in civilian surgery we have seen extensive hand cases operated on with a tourniquet applied up to three hours with no evidence of harm. In this temperate climate, we are definitely of the opinion that a tourniquet left in place for periods of two to four hours causes no particular harm from depriving the tissues of circulation. There have been no unusual edema, no slough of skin edges, no ischemic muscle complications that we could attribute solely to the tourniquet; therefore, the fear of producing tourniquet gangrene unless the tourniquet is loosened every one-half hour seems to have little basis in fact.

We are aware that tourniquets may produce nerve paralyzes and even vascular thrombosis. The experience of our group indicates these complications are very rare; in fact, an analysis of 200 random cases in which tourniquets had been applied shows that these complications did not occur in a single instance, unless they showed up after the patients left our hands, usually five to ten days after surgery. Even if these complications did occur more frequently, the role of the tourniquet as a lifesaving measure would still make its use imperative.

It is possible that prolonged tourniquet applications may be a factor in the development of gas infections in extremities. We have seen gas infections develop in extremities both with and without the application of tourniquets and have not been able to form a definite opinion on this point. The impression gained, however, is that gas infections are more prone to occur in the bloodless extremity.

#### THE TOURNIQUET IN RELATION TO PATIENTS IN SHOCK

It cannot be denied that many extremity vascular injuries stop bleeding because of thrombosis of the injured vessels, vascular spasm, or a marked fall in systemic blood pressure. Nor can it be refuted that many large soft-tissue wounds of the extremities *not* involving major vessels develop a spontaneous arrest of hemorrhage within a very short time and are best treated by pressure bandage, or, if a tourniquet has been applied, by early removal of the tourniquet. However, there are cases in which the removal or loosening of a tourniquet is unwise and unnecessary; in fact, the results may be disastrous. Two cases illustrate this effect:

An officer, admitted to a field hospital in 1943, had been wounded three hours previously by a shell fragment, which traversed his right lower arm, producing a compound comminuted fracture of the right lower humerus. No other wounds were present. Pallor, vasoconstriction, and mild to moderate shock were noted. Blood pressure was 110/66, pulse 112. It was fairly obvious that this man had lost considerable blood but was still in fair condition. Examination of the wounded arm showed an impro-

vised splint, a strap-and-buckle tourniquet applied tightly at the level of the insertion of the deltoid, a fairly extensive perforating wound of the inner aspect of the lower arm. A slight but persistent ooze was present through the wound, which, it was thought, was probably venous in character and was produced by back-stasis from a nonocclusive tourniquet. Consequently, a blood pressure cuff was placed about the arm over the tourniquet as a safety measure and the tourniquet was loosened and slipped off. The severed brachial artery promptly let loose, and during the few seconds required to pump up the blood pressure cuff, the patient lost enough additional blood (certainly not more than 100 cc.) at this critical level of his circulatory volume to reduce his blood pressure from 110/66 to 80/40 and materially deepen his shock. It is obvious what would have occurred if measures for prompt control of this hemorrhage had not been available. After 2,000 cc. of infused blood, the patient underwent operation, and recovery was uneventful.

A private, admitted to a field hospital in July 1944, had received a traumatic amputation of the left leg, just below the knee, from a German "Schu" mine six hours before admission. A marked degree of shock was noted, the blood pressure being 86/56 and pulse 116. Examination of the injury disclosed a persistent trickle of blood escaping from the badly contused stump in spite of two tightly placed strap-and-buckle tourniquets about the thigh. A large, soft-rubber-tube tourniquet was applied about the thigh which controlled the bleeding promptly. Vigorous antishock measures were undertaken in the form of transfusions of blood. At the end of three hours' treatment, having received 2,000 cc. of blood, the patient was still in such poor condition that operation was considered unwise. Ordinarily, this type of patient can be made ready for operation within one to one and one-half hours, and failure to respond usually indicates a gas infection or continued bleeding. Consequently, a further search was made for one of these causes. We were astonished to find that the fresh dressings, applied to the stump after the initial examination, were saturated with blood, and a pool of blood had collected under the patient's buttocks. The tourniquet, however, seemed adequately applied. Questioning disclosed that the tourniquet had been loosened at one-half hour intervals, and the patient had probably lost as much blood as he had gained. An additional 1,000 cc. of blood, leaving the tourniquet in place, produced the desired effect and the patient underwent a successful reamputation.

Similar cases have been seen with enough frequency to make us regard tourniquets with a healthy respect. The results of these experiences led us to conclude that *under no circumstances* should a tourniquet be loosened on a patient *in shock or in incipient shock* unless means are present and immediately available to control any hemorrhage that may occur and to replace rapidly the volume of circulating blood.

It is true that an individual who has lost a moderate amount of blood can tolerate additional, mild, rapid loss of blood without his recovery being jeopardized in the least. There are many patients, however, who have lost blood up to their critical level and are able to maintain only a semblance of circulatory equilibrium through intense vasoconstriction, rapid heart action, and other physiologic compensatory mechanisms. In these individuals the most urgent care must

be used to prevent additional loss of blood volume. The rapid loss of even 100 cc. of blood may completely break down the delicately balanced mechanism, so that the vasoconstricting apparatus fails, with resultant profound, and possibly irreversible, shock. In such instances it is safe to loosen an applied tourniquet only after the blood volume had been brought up to some extent by plasma or, preferably, by whole blood transfusions.

Patients may lose more blood than is first apparent on loosening a tourniquet, particularly in the thigh. The arterial system fills up more or less uniformly on the release of a tourniquet, and if the vascular injury is some distance below the tourniquet the injured area will continue to drain off this blood, even though the blood supply is reoccluded promptly at the first sign of hemorrhage. A very appreciable amount of blood may be lost in this manner.

Experimental work by others has shown that the release of a tourniquet may be followed by a transient drop in blood pressure, even without the loss of blood. A discussion of this phenomenon is outside the scope of this paper. It may be stated, however, that clinically significant changes have not been noted as a result of this factor in the cases we have seen.

We wish to reiterate, with emphasis, that tourniquets should not be loosened when patients are in shock, unless measures are present to replace any additional blood loss. To do so may jeopardize a patient's life.

#### TOURNIQUETS IN RELATION TO INTERNAL BLEEDING

A tourniquet should be applied to any extremity which shows evidence of developing, or which has developed, a large, pressure-producing hematoma from injury to a large artery. In general, more damage is done to an extremity from pressure and extensive infiltration of blood from this type of lesion than from the application of a tourniquet for a reasonable time. It seems very dubious that enough collateral circulation is present about such a hematoma to affect materially the viability of the distal tissues. And if a tourniquet is applied early, the chance of firm, occlusive clotting is probably increased. Certainly, the surgery for release of tension and repair or ligation of the damaged artery will be simpler, and the clots and infiltrated blood will be more satisfactorily handled if bleeding has not been permitted to progress unchecked.

#### THE TEMPERATURE FACTOR

Temperature has been shown by experimental workers to play a vital part in the speed with which necrosis of a bloodless extremity takes place. The metabolic demands of tissues of a bloodless extremity vary directly with its temperature. It seems reasonable that a cold extremity survives longer than a warm extremity when a tourniquet is applied. In general,

therefore, a tourniquet applied in the heat of the tropics or of the desert should be loosened at shorter intervals than one applied in a cool climate. It is suggested that an extremity on which a tourniquet has been placed should be left uncovered, and no attempt be made to warm the extremity by artificial means until the tourniquet is ready to be removed, care being used, of course, to prevent frostbite in sub-freezing weather. The temperature factor, at any rate, should be borne in mind when dealing with tourniquets.

#### PLAN FOR THE HANDLING OF TOURNIQUETS

In lieu of the dictum, "Release tourniquets every twenty minutes to one-half hour," the following plan is suggested for handling the tourniquet problem in war injuries:

1. Tourniquet cases should have the highest priority for transportation to the nearest available hospital, with the presence of a tourniquet plainly indicated on the record.

2. An adequate tourniquet should be placed on an actively bleeding extremity at the earliest possible moment.

3. At the end of two hours or so, provided that the patient is not in shock and depending on the circumstances of the temperature, the tactical situation, and primarily on the judgment of the medical officer, the tourniquet should be cautiously loosened. If bleeding recurs, the tourniquet should be reapplied. If no bleeding or negligible bleeding results, the tourniquet should be removed, but the patient must be kept under observation for some time thereafter.

4. Loosening of a tourniquet should always be done under the supervision of a medical officer except in exceptional circumstances.

5. Patients in shock from hemorrhage should, on no account, have the tourniquet removed within the first four to six hours after its application unless the blood volume has been at least partially replaced by plasma or whole blood. As ruthless as it may seem, the possible loss of three or four inches of a badly damaged extremity should not compromise a patient's life. After the four- to six-hour period has been reached, subsequent loosening or removal of the tourniquet should be a matter of individual judgment. One would hesitate to leave a tourniquet on after eight or ten hours even with a chilled extremity. In all likelihood, sufficient spasm and clotting will have developed by this time to prevent further bleeding.

6. Extremities having tourniquets applied should, we believe, have the temperature lowered as much as feasible, short of actual freezing.

This plan is only suggested tentatively and will necessarily have to be modified in many cases.



# Repair of Fixed Bridges and Acrylic Dentures in the Field

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The dental officer in the field has only an M.D. Chest No. 60, which has no equipment for repair of dentures; however, by picking up a few extra items—plaster of paris, base-plate wax, acrylic, a few Steele's facings, a wood clamp, and one half of a hollow rubber ball for a plaster bowl—certain repairs can be effected without sending a man to the rear.

## CASE ONE

A soldier, aged 27, was admitted to our field dental clinic for repair of an anterior fixed bridge with one facing missing.

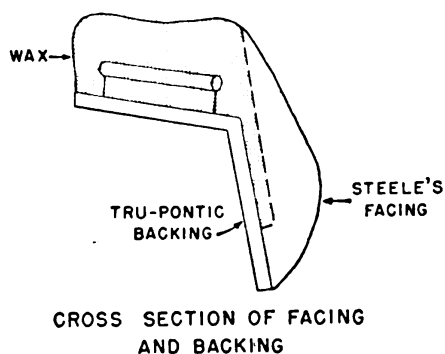
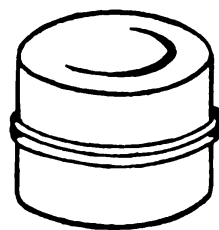


FIGURE 1

The bridge extended from R-2 to L-3 and R-1; L-1 and L-2 were replaced by tru-pontic facings. A Steele's facing was ground in to fit the tru-pontic backing. With the facing in position, base-plate wax was placed on the lingual and in the groove of the facing (figure 1). The wax was then slightly softened and the entire assembly placed in the mouth to get an accurate adaptation to the gingiva. After trial in the mouth,

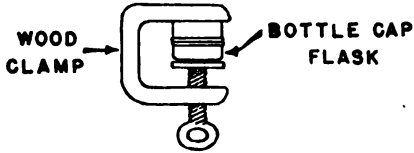
the entire bridge was invested in a large bottle cap filled with plaster. The bridge was embedded completely except for the waxed-up area. A few notches were cut in the plaster around the edges of the bottle cap to get an accurate fitting of the two bottle caps. Cocoa butter was used as a separating medium. A second bottle cap was filled with plaster and set on the lower cap. Then the two bottle caps formed a miniature dental flask (figure 2). The caps were separated and the wax boiled out. Acrylic was then mixed and packed into the



"BOTTLE CAP"  
FLASK

FIGURE 2

space occupied by the wax. Cellophane from a cigarette pack was used between the flasks and the wood clamp for a press (figure 3). The case was processed in the usual way, and the bridge was removed from the plaster. The acrylic held the Steele's facing firmly to the tru-pontic backing and seemed very



WOOD CLAMP USED AS PRESS

FIGURE 3

be used successfully. Some acrylic dentures can be repaired in the field with the above-mentioned armamentarium without the use of a flask.

#### CASE TWO

A soldier brought in a broken upper partial acrylic denture. We brought the two parts together with the aid of the base-plate wax. Using bathroom tile for a slab, a large amount of plaster was mixed and the waxed partial was embedded except for the waxed break. The plaster was formed into a block. Deep notches were cut on the edge of the block, the wax removed, cocoa butter spread on the block, and the second half of plaster poured, forming it into a block (figure 4). The two blocks were separated and the broken edges cut away with a bur. Enough was cut away on both sides to ensure a strong joint. Pink acrylic was mixed and packed and cellophane placed for trial packing. Two thin blocks of wood were placed on the top and bottom of the two blocks of plaster and the wood clamp applied (figure 5). Trial

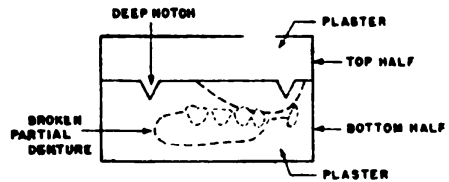


FIGURE 4

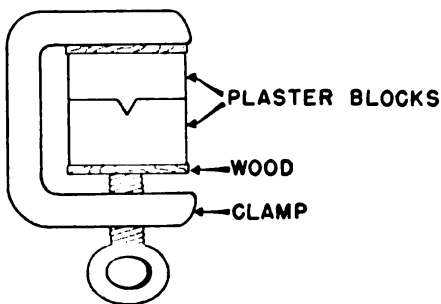


FIGURE 5

packing was carried out and cellophane was left in the final pack to provide a smooth finish. The case was processed, removed, and polished.

This method has proved successful in several cases and is recommended as a field expedient in simple fractures of acrylic dentures. It can also be employed where a tooth has broken off a denture.

# An Introduction to Psychiatric Problems

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While obscure clinical pictures associated with disturbed emotional states challenge the medical officer, careful judgment and skill in managing such patients will return many soldiers to duty. In dealing with the so-called functional group, the medical officer is often prejudiced by the neurotic coloring, and he may fail to obtain a careful history and physical examination; or he may become engrossed in an organic disease present and overlook the emotional component of the problem.

A neuropsychiatric evaluation is often necessary in this group of patients. Constantly the necessity becomes more obvious for all medical officers to learn the fundamental principles of neuropsychiatry. The basic principles that will enable any medical officer to approach these problems with an understanding attitude will be outlined.

## PERSONALITY DISORDERS

The following classification is somewhat arbitrary. There are transitional states with mixtures of all types, but for practical purposes it will be helpful to regard those described here.

1. *The reactions of the normal personality* are usually found in persons with a well-integrated personality, who can take situations in stride, and yet they are subject to some anxiety, fears, and untoward reactions under intense strain, stress, fatigue, emotional deprivation, and prolonged somatic illness. The emotional pattern of these individuals can scarcely be distinguished from that of those with mild psychoneurosis. The difference between the two is a matter of degree.

2. *The psychoneuroses* are conditions in which there are abnormal psychologic states (anxieties, fears, phobias, and compulsions), unaccompanied by demonstrable structural changes in the brain. There may also be somatic dysfunctions without demonstrable histopathologic changes and these are labeled "psychosomatic."

The patient with a mild psychoneurosis has superficial anxieties, fears or psychosomatic disturbances, such as palpitation of the heart and transient elevations of blood pressure. The personality organization of these individuals is basically sound. The

disturbance in their equilibrium is manifested in mild fluctuating symptoms precipitated primarily by external factors arising from the current situation. Elimination of the noxious conditions or better adjustment to the precipitating factors results in marked improvement.

The patient with severe psychoneurosis manifests deep-seated anxieties, with greater tenacity of fears and encroachment on the capacity to perform military duties. The clinical picture is more easily evoked by external factors of less intensity. The personality configuration of these individuals is essentially unstable with psychoneurotic patterns which have become well crystalized since childhood. Their conflicts are more often related to the instinct of self-reproduction and repression plays an important role. The clinical form of their conflicts may be expressed in a rich psychologic elaboration with phantasies.

Psychosomatic disorders are characterized by dysfunctions of organs, especially those innervated by the vegetative nervous system. Their conflicts center around the instinct of self-preservation (the vital functions) with much less of a psychologic type of content. The individual who is aware of his gastro-intestinal tract will carefully watch the type of food he consumes and be on the alert to take good care of himself. The individual with a psychoneurosis responds more quickly and is more amenable to psychotherapy than is the individual with an additional psychosomatic disorder.

With the development of hypochondriasis in the patient, a transitional stage to the psychosis is established. Although the psychoneuroses and psychosomatic disorders have been described separately, no sharp line can be drawn between them; each merges imperceptibly into the other. The psychoneurotic individual may display psychosomatic symptoms and the individual with a psychosomatic disorder is usually psychoneurotic.

Soldiers who are frequently suspected of "gold-bricking" usually are those with a psychoneurosis or a psychosomatic disorder. In the past these reactions have been termed shell shock and traumatic neurosis. These conditions are characterized by a constant state of tension, apprehension, generalized tremors with various forms of inhibition, such as inability to talk, walk, or sleep, hypersensitiveness to stimuli of all kinds, and frightening dreams in which the precipitating events are repeated and relived over and over again. For practical purposes such persons may become as helpless as those with psychoses.

A parallel exists between the signs and symptoms of the psychoneurotic with a psychosomatic disorder and the manifestations of the labile physiologic state of the normal infant. The following discussion may offer an insight into the physiopathology of some of the psychosomatic symptoms encountered.

*Psychosomatic symptoms of the adult reflected in physiologic patterns of infancy.* In normal and especially in psychoneurotic persons, some elements of childhood behavior persist

into adulthood. The more severe the psychoneurosis, the greater the degree of domination of the adult personality by the child within us. The adult-infancy parallelism<sup>1</sup> will now be described.

The cardio-respiratory system in the adult who has neuro-circulatory asthenia reveals tachycardia, rapid, irregular breathing with sighing respirations, and blushing and blanching of the capillary bed. These are normal physiologic manifestations of the cardio-respiratory system of the infant. The gastro-intestinal tract of the psychoneurotic adult shows such symptoms as diarrhea, segmental spasms of the intestinal tract, gaseous distention, colicky, abdominal pains, and occasional nausea and vomiting, which are also commonly manifested by the gastro-intestinal tract of the infant. The genito-urinary tract of the psychoneurotic adult often manifests frequent urination, urgency and enuresis, which are normal functions of the genito-urinary tract of the infant. The thermo-regulatory center in the psychoneurotic adult often may be unstable as evidenced by frequent elevations of temperature of 99 to 100 degrees when the individual is under slight emotional stress and strain, which is a usual finding in normal infancy. These phenomena are released in the psychoneurotic adult by certain physiologic or psychologic stimuli and represent a regression to an infantile pattern of physiologic function.

3. *Constitutional inferiors* belong to a class not listed in Army medical nomenclature. These individuals cannot endure the ordinary stresses and strains. They are emotionally unstable. They fatigue easily and develop psychosomatic reactions on the slightest provocation. However, they do not come into conflict with society as do constitutional psychopaths. On this substratum of inferiority, psychoneurotic or psychosomatic reactions are readily superimposed.

4. *Constitutional psychopathic states* are synonymous with psychopathic personalities. They are impulsive, excitable, irritable, explosive, irresponsible. A soldier typical of this group goes AWOL, is rebellious, refractory to discipline, chronically alcoholic, and egotistic. His early history may reveal persistent enuresis, truancy, stealing, and defiance of authority. The rarely encountered genuine malingerer belongs to this group. He deliberately feigns illness to avoid responsibility or escape from unpleasant situations. We may not consider him sick but he has a diseased character. This behavior pattern often is confused with that of mild psychoneurotics who consciously exaggerate their symptoms to attain certain ends. In true psychoneurosis, the difficulties are unconsciously motivated; in the malingerer there is always conscious motivation.

5. *Psychosis* present the most serious form of a personality disorder. The thoughts, feelings, and attitude toward reality are distorted and manifested by delusions and hallucinations.

1. Michaels, J. J.: A Psychiatric Adventure in Comparative Pathophysiology of the Infant and Adult with Some Theoretical Suggestions in Regard to Regression in Somatic Visceral Functions, *J. Nerv. Ment. Dis.*, 100:49-63, July 1944.



The conditions consist of manic-depressive psychosis, paranoid state, and dementia praecox (schizophrenia). Constitutional factors play a greater role in psychosis than in any other neuropsychiatric entity, and the responsible factors probably occur much earlier in the formation of the personality than in psychoneurosis. The psychoses and constitutional psychopathic states differ qualitatively from the psychoneuroses. Psychosis is more apt to develop in persons with constitutional psychopathic states than in psychoneurotic individuals.

6. *The organic brain syndrome*, which is characterized by disturbances in memory, impaired judgment, disorientation, emotional lability, and change in character, is due to general paresis, cerebral vascular disease, toxic conditions (bromide intoxication, alcoholism), or an acute infectious process.

7. *Mental deficiency* indicates a low intelligence in which there is definite impairment in reasoning. The early history of the individual will reveal retardation in development, delayed walking and talking, backwardness in school, and inability to perform average tasks.

#### PRACTICAL APPROACH TO CLINICAL PROBLEMS

A conception differing from that employed in internal medicine is used to define, diagnose, and classify psychiatric syndromes. Psychiatry which attempts to deal with the patient as a total personality is more interested in the kind of person who has a disease and his reactions to the disease. General medicine has been more interested in the structural changes produced by the disease. Much will be gained if the psychiatric and medical points of view can be combined. In estimating the neuropsychiatric components of the clinical picture, medical officers must bear in mind the above definitions and classification and become imbued with a point of view which places the person as the center of investigation. While taking the patient's history, data pertaining to his mental status will be observed—general behavior, stream of talk, mood, misinterpretation and delusion, compulsive phenomena, illusions, hallucinations, orientation, memory, grasp of general information, judgment, and insight.

Psychic evaluation begins with the first contact of the patient and the medical officer. The soldier-officer relationship is superimposed on the patient-physician relationship. If the medical officer remains neutrally sympathetic and is attentive, much will be accomplished.

The patient may relate a long and incoherent history which in itself should arouse the curiosity of the medical officer. By giving our undivided attention so that the soldier feels his story is being listened to for the first time, his confidence is won. His facial expression and manner of telling the story afford clues to his personality. The intensely anxious soldier will reveal this in his tense expression. He over-reacts to the slightest physical stimulus. The facility with which he laughs or cries will reflect emotional lability. The patient with hysteria with con-

version phenomena (hemianesthesia, hemiplegia, or tubular vision) may have an expression of indifference and appear calm. The psychopathic personality who chronically repeats antisocial acts may have a hardened, cruel face expressing no kindly feeling. The psychotic may reflect the disturbed harmony between his feelings and thoughts by silly grinning or unmotivated laughter. The patient with actual organic disease may minimize or even deny his symptoms. A multiplicity of complaints often indicates the functional nature of an illness. Each complaint tells something more than just a localized symptom. Persons with psychosomatic symptoms speak with their organs rather than with their thoughts and feelings.

*Family history.* In taking a history, a serious chronic illness in the family is important from the standpoint of inheritance, and because of the psychologic effect it has had on our patient. The psychologic atmosphere of the family has an influence on the development of the personality. The sudden demise of a parent may bring with it fear of sudden death from the same cause in our patient. Fear that a disease might be inherited may cause as much damage as the actual inheritance of a disease. The parent with psychoneurosis often presents to the child a behavior pattern which the child adopts. A psychoneurotic parent with headaches, diet fads, and insomnia furnishes an unhealthy environment for the developing child.

The death of a child's mother when he is one year of age has a much more serious effect on the psychologic development of the child than her death would have when the child is six years of age. The illness of the patient when under the age of six calls forth much parental anxiety, over-solicitude, and over-protectiveness. The child unconsciously incorporates this parental anxiety, and as an adult, he nurses himself as his mother did when he was a sick child.

The doctor tends to make the history fit into patterns that correspond to his medical training which stressed organic disease and statistical events. If a soldier had typhoid fever at the age of 12, we anticipate possible gall bladder involvement and overlook the psychologic aspects of the long illness.

The patient may become fixated on the idea that he has a serious illness when it is in fact a minor illness. He may nurture this idea as the result of a mistaken diagnosis by the family doctor. In functional disorders of the heart, the physician prescribes rest and avoidance of exercise, thus preventing the child from participating in sports and social activities. Intolerance to exercise results, and palpitation and tachycardia easily follow. A "heart complex" develops that is as real to the patient as any physical condition can be.

Past injuries and operations are fertile soil in which seeds of conflict grow. A minor deformity becomes the locus on which feelings of inferiority are centered. A past illness becomes the site on which conflicts surreptitiously fasten. The facility with

which an emotional state fuses with a physical condition to form a psychosomatic unity is known as somatic compliance.

The school record is a guide to the degree of intelligence. Social adjustment will be revealed by the manner in which he got along with teachers and students. A history of truancy may suggest delinquent trends, harbingers of the constitutional psychopathic states.

Occupational adjustment can be gaged by the number of jobs held, length of time on a job, shifting of vocations, and his relation to employees and employers. The patient who is psychoneurotic or subject to psychosomatic disorders may lose considerable time from work because of frequent minor illnesses.

*Habit.* The significant habits of childhood are persistent thumb sucking, nail biting, enuresis, temper tantrums, stuttering, stammering, tics, and night terrors. In the adult, alcoholism reveals the underlying emotional instability often reflective of the psychopathic personality. Excessive indulgence in smoking speaks for states of tension. A history of arrests may be indicative of psychopathic personality.

The psychosexual history must be tactfully elicited. Significant maladjustment may be revealed in the reaction to masturbation with the development of erroneous conceptions about it. Promiscuity is reflective of immature individuals who must continuously prove their virility to themselves. Homosexuality can give rise to anxiety in psychoneurotics or it may be accepted without conflict and without suffering in the psychopathic personality. The marital life may be an immature relationship in which one partner relates himself to the other as a child to a parent. This child-parent relationship occurs frequently in patients with psychosomatic disorders. Actual incompatibility of a sexual or a temperamental nature is an important consideration.

Separation from family and friends on entering military service is a significant etiologic factor in emotional conflict. The soldier may have made satisfactory adjustment in civil life with the development of special methods of dealing with his conflicts. Leaving his job for one which brings to the fore the necessity of being dependent may create a state of panic.

*Present illness.* If one has conscientiously followed the historical development of the patient physically and psychologically, it becomes apparent that the present illness represents a new edition of previous difficulties—an epitome of the past. When, however, the condition is a mild psychoneurosis in which the precipitating factors were intense, the past history reveals healthy adaptations and adjustment.

Calm objectivity is paramount in the acquisition of historical data. If the medical officer can view data of a personal and psychologic nature in the same scientific spirit that he regards purely medical data, he will have gained an insight into the personal problems of the soldier which reflect themselves in the so-called functional disorders.

## COMMENT

The more common mental disorders have been outlined and defined. A thorough understanding and constant use of this scheme will help bring order into the method of approach of the medical officer. If the psychiatric-medical point of view comes to prevail, diagnosis, treatment, and disposition will be accelerated and more efficiently performed, and the medical officer will be in a better position to inaugurate psychotherapy.

This means patiently explaining to the soldier the nature of his neurotic difficulties, reassuring him, and giving him insight. Time and energy can be saved by the proper evaluation of these problems. Unnecessary x-rays, consultations, and laboratory studies will be avoided. If medical officers on the general medical and surgical wards will adopt these points of view, perhaps the disproportion between the small percentage of psychiatrists in the Army and the comparatively high percentage of soldiers discharged for neuropsychiatric disabilities can be reduced.

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## Venereal Disease Control Program

CAPTAIN LEONARD L. HEIMOFF

Medical Corps, Army of the United States

I wish to set forth the origin and maintenance of a venereal disease control program which has been helpful to our post and to the surrounding localities. Credit is due the Venereal Disease Control School at Johns Hopkins Hospital for many of the ideas and plans of this program. Salient features of programs at other camps, made available through circulation of ideas by the Venereal Disease Control Division, Office of The Surgeon General, and the venereal disease control officer, headquarters, "Y" Service Command, have been used to make our program successful. When it is realized that nearly all venereal disease cases are preventable, the need for a successful venereal disease control program is obvious. The establishment and maintenance of a successful venereal disease control program must be accompanied by close cooperation between the post commander, the post surgeon, and the post venereal disease control officer. Without their interest and help no program could hope to be successful.

This camp had the highest venereal disease rate for all stations of the service command in 1942, with a monthly rate average of 68 per 1,000 per annum. It was then decided to assign a venereal disease control officer to this post. On analyzing the data presented to this officer on arrival, the following facts were found:

1. Negro troops were causing 70 percent of all new cases of venereal disease.

2. No effective venereal disease control program existed in any of the surrounding communities, although there was a willingness to participate in a program by these communities.

3. A definite lack of knowledge concerning venereal diseases existed on the part of the troops.

4. The prophylactic program was not successful.

A venereal disease control program was then organized under two major headings: (1) What could the military authorities do to help lower the Army's venereal disease rates? (2) What could the civilian authorities do to help lower the venereal disease rates in this area? Both phases of the problem were attacked simultaneously.

The basis of the military phase consisted of a sound educational program in relation to venereal disease. A venereal disease quiz was conducted to determine how much the soldiers actually knew. It was found that they knew very little, although they had been lectured to and shown movies. This was most marked among the Negro troops. The educational program was designed to help them, since their venereal disease rate was 15 to 20 times the white rate.

We had to create a group of colored noncommissioned and commissioned officers to act as venereal disease aides and liaison officers. They were chosen on the basis of their past education and the respect which they commanded from their men. Each barracks furnished one man. A three-week course in venereal disease control, conducted by this officer, was given the men. Race pride and unit pride were kept before them at all times. They were taught how the venereal diseases arise, how only infected people transmit them, and how prophylaxis can prevent venereal disease. They attended clinics, worked at prophylactic stations, and gave lectures and demonstrations. This program of training colored venereal disease aides is a part of War Department Circular No. 88, 28 February 1944. When these men finished the course, they were given diplomas at a formal graduation, presided over by the post commander, as evidence of their achievements. Graduation served to impress both enlisted men and officers with the fact that the venereal disease control program was an integral part of the post routine. These men then began to teach venereal disease control to the units they represented, and so, in quick fashion, each and every Negro soldier was reached by a member of his own race whom he respected and believed. Use was made of all available posters, pamphlets, and movies. Each battalion was shown a film a month, consisting of "Know for Sure," "With These Weapons," "Syphilis," "Pick-Ups," and "The Magic Bullet." Available free periods, including time between training classes, were used in discussing venereal



disease and its prophylaxis. At night, during barrack "bull sessions," the venereal disease aide was to direct the conversation into venereal disease channels and to disseminate correct knowledge about the diseases.

On the arrival or activation of new units every soldier was given a physical inspection. This uncovered a great many cases which had existed prior to service, prevented the local civilian women from being exposed to infected soldiers, and showed the new unit that this post was venereal disease conscious. All new unit commanders were contacted and an hour was spent in discussing their venereal disease problems and in "selling" them an active prophylactic program for their units. This meeting with new unit commanders, if successfully conducted, was extremely profitable, since by personally enlisting their aid in the program the groundwork for their future cooperation and help was laid. Prophylactic programs were arranged so that every exposed individual would have free access to a prophylactic treatment, either self-administered or at a prophylactic station. Individual prophylactic kits were made freely available to all soldiers in their day rooms and in the surrounding municipalities by having them placed at firehouses, hospitals, and drugstores. Every soldier had seen at least one demonstration as to how to use these kits, and if a man reported to the prophylactic station for the first time, he was given a treatment with the individual kit. This taught him how to use the kit and gave him confidence in its efficacy. After the troops realized what the venereal diseases were and how they could be prevented they were anxious to use prophylaxis. A good deal of time and continuous effort is always placed on prophylaxis. The graduates of the venereal disease assistants' course attend weekly conferences with the venereal disease control officer. Statistics and local venereal disease news are exchanged and efforts made to show the men how small a chance they have of escaping a venereal disease from an unprotected sexual exposure. The meetings work out well and keep the V. D. control officer in touch with graduates of the school, who are now his colleagues instead of students.

When I arrived in April 1943, the average number of prophylactics given in the nearest large community was only 80 per month and there was some thought given to discontinuing this station. The venereal disease rate of the colored unit on this post for that month was about 500 per 1,000 per annum. After one month, the number of prophylactics given there was 500 per month and the colored venereal disease rate was down to 100 per 1,000 per annum. For the last four months of 1943, the average number of prophylactics given was 1,800 and the average venereal disease rate for six times as many colored troops as were here in April 1943 was only about 35 per 1,000 per annum; and for the month of December 1943, it was the lowest in the service command. For the first six months of 1944, the average prophylactic rate has been over 2,000 per

month, and the average colored venereal disease rate has continued to be the lowest in the service command with an average rate of 37 per 1,000 per annum. In addition, there have been distributed about 40,000 individual prophylactic kits free of charge (3,000 bought from post funds and the rest from individual unit funds). There is now no question at this post as to whether or not prophylaxis can prevent disease. Sulfathiazole prophylaxis has not yet been used here because of the danger of creating latent asymptomatic carriers, of prolonging the normal incubation period of gonorrhea, and because it does not prevent infection with syphilis. Thus, by placing the responsibility for sex hygiene squarely on the shoulders of each individual and by teaching him why and how to protect himself from dangerous diseases, we have removed the scourge of ignorance which hampers venereal disease control programs.

We aimed at reducing the number of sexual exposures by increasing special events on the post and in the local communities, thus keeping more soldiers occupied with decent amusement rather than having them looking for things to do. Contact was made with the special service officer as well as with the local U.S.O.'s and "Y" committees. Soon there were "swing" concerts, boxing matches, spirituals, revival meetings, and dances, with the local civilian committees furnishing the girls. Each soldier attending a sponsored event is a soldier who will not be getting a venereal disease that night; and the more events we have and the more soldiers who attend them, the lower will be the sex exposure rate and, in turn, the venereal disease rate.

It was decided to make unit commanders more aware of their responsibility in preventing venereal disease. I wrote an official venereal disease control program in the form of a post memorandum, which was put into effect on 4 March 1944. Many of the features of this memorandum are contained in War Department Circular No. 88, 28 February 1944. The important features of the program are the giving of weekly talks by company officers to units with high venereal disease rates, the explanation of reasons for high rates, in writing by the unit commanding officer, the appointing of venereal disease assistants for each barracks and platoon, the giving of prophylactics to intoxicated soldiers, and daily talks on venereal disease by unit venereal disease assistants. This memorandum, if actively carried out, will reduce venereal disease in most units.

The venereal disease control officer works actively with the post and district provost marshals, with the divisional venereal disease control officers and provost marshals, and with the special service officers and post exchange officers. He investigates, with the military police or local police, all places which present venereal disease hazards to troops, recommends ways of removing these hazards, checks the adequacy of the prophylactic stations, and is responsible for the adequacy of venereal disease diagnosis and treatment at unit dispensaries

This officer attempts to stimulate organizational and race pride by publishing each week the venereal disease rates of the post and the units with high rates. Thus, units with high rates know each week that they are high, and a letter from this office goes to the unit commanding officer suggesting ways and means to lower his excessive rates. Each month, all units are told how many prophylactic treatments were administered to their respective units in the cities. If a unit has a high venereal disease rate and a low prophylactic rate, that unit is failing to cooperate in our program. Each month, likewise, unit rates are published and organizations with rates over 40 per 1,000 per annum must comply with provisions of the memorandum from the headquarters of the camp, issued in March 1944.

#### CIVILIAN ASPECTS

The basis of the civilian aspects of venereal disease control must be mutual cooperation between the military and civilians and trust and respect for each other's individual problems.

To get the interested cooperation of all civilian groups and to coordinate the program, it was decided for these groups to meet once weekly at 1000 o'clock each Wednesday at the station hospital, venereal disease control office. Attending the meetings are representatives of the state and local police, of the state and local health departments, of five larger cities and smaller cities nearby, a representative of the enforcement branch of the state liquor control board, representatives of city "A," post and division provost marshals, the division venereal disease control officer, and a colored venereal disease assistant. At these meetings venereal disease rates and causes are discussed, problems are brought forth, mutual discussions go on, and plans are made for the coming week. By doing this, we can quickly swing our forces from white to colored problems, from one city to another, or from one section of a city to another. These meetings are always fully attended and a great deal has come from them. Of late, they have been attended by members of the American Social Hygiene Association, the National Brewers' Foundation, and the Division of Social Protection, Federal Security Agency, for the purpose of observation and starting similar meetings at other military establishments.

To get more detailed and accurate information from diseased soldiers as to where and from whom they got their disease, the state health department has placed a nurse on full-time duty with the venereal disease control office of this post. She takes the contact histories (W.D., M.D. Form 140) and through her careful records we have been able to locate and bring under treatment many local girls who otherwise might have continued to spread disease. Many times, however, the soldier does not remember any names or streets. In the past, these histories would be returned by the local police and health departments with the note, "Unable to locate." To get around the "unknowns," the venereal disease control officer has a

talk with the infected soldier, in which stress is put on how this girl will continue to infect others unless she is found quickly. The soldier usually is able to say that, although he does not know the name or address, he knows how to get there and would recognize the girl. Contact is then made with the local police and health departments and the soldier is brought to town; quite often the girl and house are found. With this increased cooperation between the military and local groups, we have been able to find many sources of infection which in the past had escaped us. The police department of city "A" has created a vice squad which is extremely proficient in preventing street and tavern solicitations and in finding houses of prostitution. They send a report to our office concerning every girl picked up by the police, including her picture and circumstances of arrest. All soldiers who are named on these reports are brought up for physical examination and any hidden cases are thus found. The pictures of the girls are of definite value in establishing a positive contact and save a lot of time and effort when a soldier positively identifies the picture of a girl who is already known to the police.

The problem of what to do with infected girls caused a great deal of discussion. Since hospital beds were very limited, most of the infected women were treated on an ambulant basis and quarantined in their homes. This did not work very well, and many infections were arising from girls who were supposed to be under ambulant treatment or under quarantine. On the insistence of the military venereal disease control officers, the state health department built a quarantine home for infected women where they would be kept until cured. The home was located in city "F," and was opened 1 July 1943, with a capacity of forty beds. All infected girls who cannot be trusted to take outpatient care and cease being promiscuous are sent there for cure. The capacity of this home is now eighty beds. During the first year of its operation about three hundred girls were treated. When a girl becomes a repeat offender, we attempt to have her placed in some correctional institute rather than at the quarantine hospital.

Many infections were arising as a result of soldiers becoming intoxicated and "picking up" infected women in bars and taverns during late hours. To combat this problem the liquor dealers themselves were contacted. Meetings were called in various communities in which the mayor, police department, provost marshal, and all liquor dealers were asked to participate. Our problem was explained; they were told how bars and taverns facilitated meetings between men and women and how the intoxicated soldier was more likely to get a disease. It was suggested that if they would agree to curb the sale of intoxicants to service men after 2300 o'clock on weekdays through Friday and after 2400 on Saturdays, it would be of great value to our program. The dealers agreed, and although no official curfew was established, the liquor dealers

themselves established it for servicemen. Since March 1943, this voluntary curfew has been established in eight cities; it has worked exceptionally well, and recently an additional city has inquired as to how to establish the same sort of voluntary curfew. When a tavern or hotel is named as the place of procurement or exposure, a letter from the venereal disease control officer goes to the manager, suggesting a meeting. The venereal disease control officer thus gets to know these people and they, in turn, have contributed much by preventing their establishments from becoming "facilitators."

The problem of providing adequate social and recreational facilities for Negro soldiers has not been completely solved. I became an honorary member of the Negro Civilian Defense Committee in city "A." The problem was discussed, and they went to work to help solve it. The U.S.O. facilities were enlarged, the Elk's Club built a canteen for colored soldiers, the churches provided cots and sleeping accommodations, and many affairs and parties were held, including one or two dances a month for colored soldiers on the post. All this was aimed at taking the soldiers off the streets. This committee helped in another way; representatives visited the homes of young wayward girls to talk with them and their parents; they talked with the owners of bars and taverns and suggested that, from the viewpoint of "race pride," they take more care of their own colored soldiers. This approach has worked well.

To cooperate further with local health departments in their battle against venereal disease ignorance, I often serve as guest speaker or lecturer to all nearby communities. I have helped set up municipal venereal disease control programs in six cities, and have worked with the health and police departments of these cities. I have also worked closely with representatives of the American Social Hygiene Association and the Federal Security Agency. This phase of our activities is directed at awakening community consciousness of venereal disease problems and promoting postwar venereal disease control activities. Thus, all phases of community work are stressed, since it is realized that a camp's rates usually reflect the rate of the surrounding civilian communities.

At this post, the venereal disease control officer is also chief of the venereal disease section of the station hospital. He is responsible for diagnosis, treatment, and outpatient care of all venereal disease cases. Since this post started the duty-status treatment for gonorrhea, under the direction of the venereal disease section of the hospital, it has greatly lowered its "days lost." I also conduct classes on the diagnosis and treatment of syphilis and gonorrhea for medical officers of the various divisions which have been stationed here, to familiarize them with the most recent advances and to aid them in treating venereal disease problems in the field. These classes, which are authorized by S.G.O. Circular Letter No. 105, paragraph 5, dated 11 September 1942, have been well received.



Thus, by concerted and vigorous action on the part of all interested parties, an adequate and progressive venereal disease control program has been established at this camp and in all surrounding communities. The venereal disease rates and the days lost because of venereal disease are at low levels. All units on the post as well as all surrounding communities are venereal disease conscious and anxious to help.

In February 1943, the white rate was 55 per 1,000 per annum; the colored rate was 275 per 1,000 per annum, and there were 1,000 days lost from duty. In February 1944, the white rate was 13 per 1,000 per annum; the colored rate was 40 per 1,000 per annum with only 390 days lost from duty. At no time during the last six months has our colored rate been above 40 per 1,000 per annum. For the first five months of 1944, our colored rate averaged 36 per 1,000 per annum, the lowest colored rate in the service command. Our colored prophylactic rate is still at a high level.

With continued efforts, increased educational standards for Negro troops, and continued cooperation between civil and military authorities, it is hoped that the venereal disease rates for this post and this area of the state will continue to go down and that all troops who leave this post will carry with them a sound knowledge of venereal disease and how to prevent it.

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## Perennial Bronchial Asthma

### Analysis of One Hundred Cases

CAPTAIN PHILIP E. ZANFAGNA

Medical Corps, Army of the United States

A study was made of the first one hundred cases of bronchial asthma\* diagnosed and treated in the allergy wards of a station hospital. A review of this work may help to awaken the medical profession to the challenge that bronchial asthma presents. For simplicity we have been guided by Rackemann's etiologic subdivision of asthma into (1) extrinsic, in which the patient presents hypersensitiveness to known specific substances, and (2) intrinsic, which represents the skin-negative individuals whose symptoms are caused by factors within the body.

During the first eight months of 1943, 305 soldiers were seen in acute or chronic attacks of asthma. This station represents one of about 1,000 Army posts and Army Air Forces stations in continental United States. The number of asthmatics

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Colonel T. L. Ferenbaugh, commanding officer of the station hospital, Camp Forrest, Tennessee, suggested the study of psychic trauma as a "trigger factor" in bronchial asthma.

\*Unless otherwise designated, the term "asthma" will be used to mean perennial bronchial asthma.

likely to have attacks at these installations does not include the potential cases now overseas nor the other branches of the armed forces and the women auxiliaries. When these numbers are added to the thousands of individuals rejected for this condition, the enormity of the problem will be obvious.

This series of 305 cases comprised soldiers from 19 to 42 years of age, the average age being 28 years, of whom 51 developed symptoms in the first decade of life. Nine admitted the onset subsequent to pertussis; 8 followed pneumonia; one patient developed asthma shortly after a tonsillectomy. Two patients stated that they were "born with asthma." Vaughan<sup>1</sup> diagnosed asthma in an infant less than three hours old.

#### ETIOLOGY

As shown by Cooke and Vander Veer<sup>2</sup> and later confirmed by Spain and Cooke,<sup>3</sup> heredity is one of the most important predisposing factors. In this group, 65 had a family history of asthma; 9 had a family history either of hay fever, migraine, or urticaria, and 26 denied knowledge of familial allergy.

The role played by psychomantic influences in the production of attacks will be one of the major contributions to allergy arising from the war. In this series 2 patients attributed their initial attacks to fright from a lightning flash. Both had a family history of asthma, and both patients showed multiple sensitivities to skin tests. One case had an eosinophilia of 7 percent. Incidentally, only 10 patients showed an eosinophilia of more than 5 percent, the highest being 12 percent. Seven of these cases had mild symptoms. This seems to indicate that eosinophilia is not a common finding in asthma or that its presence does not indicate the severity of the condition. Four cases developed acute symptoms while taking physical examinations for overseas duty. One patient, clinically free from asthma for two weeks, suddenly developed an acute attack after receipt of bad news from home. He became depressed and developed intractable asthma. Adjustment of the psychic factor in this case resulted in an immediate recovery. Subsequent reports may show that the absence of psychic influences in many cases may act like the pin that keeps the hand grenade from exploding.

*Allergens.* Rackemann<sup>4</sup> believes that more than 75 percent of all asthma is extrinsic. In this age group 92 percent showed marked skin reactions to one or more of the common inhalants: 3 were sensitive to dust alone, 2 to mixed feathers, 12 to dust and mixed feathers, 2 to orris root alone, 4 to dust, mixed feathers, and orris root; 12 to dust, mixed feathers, kapok, and orris root; 2 to dust and pyrethrum; 40 to dust, mixed feathers, and one or

1. Vaughan, W. T.: *Practice of Allergy*. St. Louis: C. V. Mosby Co., 1939.

2. Cooke, R. A., and Vander Veer, A., Jr.: *Human Sensitization*, J. Immun., Balt., 1:201, 1916.

3. Spain, W. C., and Cooke, R. A.: *Studies in Specific Hypersensitiveness; Familial Occurrence of Hay Fever and Bronchial Asthma*, J. Immun., Balt., 9:521, 1924.

4. Rackemann, F. M.: *Clinical Allergy Particularly Asthma and Hay Fever*. New York: Macmillan, 1931.

more of the animal danders; and 15 showed marked skin reactions to dust and to one or more of the animal danders. Ten patients, in addition, showed positive skin reactions to various foods of Army diet, but elimination diets did not prevent the recurrence of symptoms. However, dietary management did clear up concomitant urticaria in 2 of these cases.

#### TREATMENT

Sixty-five patients were seen in acute asthmatic attacks. Epinephrine hydrochloride, 1:1,000 solution given subcutaneously in a dosage of 0.3 cc. repeated one or two hours later, relieved the bronchial spasm. This procedure was followed by the oral administration of an ephedrine-theophylline compound for forty-eight hours. Symptoms of chronic asthma persisted in 15 of these 65 cases. Excellent results were subsequently obtained with small doses of potassium iodide.

Ten cases were admitted with intractable asthma in whom severe symptoms had persisted for forty-eight hours or longer in spite of frequent epinephrine injections. These patients were given an immediate infusion of a liter of 5 percent solution of dextrose containing 0.24 gm. ( $3\frac{3}{4}$  grains) of aminophylline. One hundred percent oxygen was used in 3 cases for cyanosis. The procedure was followed four hours later by an intravenous injection of 0.24 gm. ( $3\frac{3}{4}$  grains) of aminophylline diluted in 10 cc. of saline. Caution must be used in administering this solution very slowly without extravasation into the perivenous tissues. These patients were all placed on a liquid, milk-free diet for twenty-four hours. Small doses of whiskey were given at periodic intervals. Ammonium chloride in 0.32 gm. (5 grains) dosage was effective in facilitating expectoration. Fifteen cc. of paraldehyde in 120 cc. of olive oil given rectally induced sleep within thirty minutes in cases to which it was administered.

After twelve hours small doses of epinephrine hydrochloride were used for the first time very effectively. Two-cc. ampules containing 50 percent ether in peanut oil were employed intramuscularly in 2 cases, but further trial is necessary to evaluate the efficiency of this product in intractable asthma. In no case was the use of morphine sulfate or any of its derivatives considered. It cannot be emphasized too strongly that all cases of status asthmaticus should be hospitalized immediately.

Symptomatic treatment, although necessary to relieve symptoms, has no value in removing the basic etiologic factors responsible for asthma. Only 8 soldiers admitted being skin-tested and given etiologic treatment in civilian life. Five were told that they would outgrow the condition; 25 were convinced by their family physicians that nothing could be done for them. This pessimistic attitude became alarming when it was realized that every state in the Union was represented in this analysis and that 65 patients were residents of cities with a population

of more than 100,000. Allergists<sup>5 6</sup> have reported about 20 per cent cures in the treatment of asthma with specific measures.

#### COMPLICATIONS

The presence of right-ventricular enlargement in a comparatively high percentage of patients with pulmonary emphysema complicating asthma has been demonstrated by recent studies.<sup>7</sup> Several investigators<sup>8</sup> proved the presence of cor pulmonale by autopsies in chronic asthmatics. None of our cases showed these advance complications. Nine cases were complicated by chronic bronchitis, and 6 by sinusitis. Six cases showed slight emphysema, and only one had a severe chronic emphysema demonstrated clinically and by roentgenograms. In every case, symptoms of asthma preceded the complications by at least five years. Suitable treatment of the complication resulted in more favorable response to treatment of the asthma. Such sequelae as bronchiectasis, pulmonary atelectasis, bronchostenosis, or spontaneous pneumothorax were not encountered in this series of 100 cases.

Bronchial asthma is a common disease of childhood and puberty. Hundreds of potential asthmatics who have been taken away from their former favorable environment and exposed to greater concentrations or probably new allergens, individuals who will be subjected to greater physical exertion and psychic trauma, will develop symptoms for the first time. The Fourth Service Command through the efforts of Colonel S. W. French,<sup>9</sup> chief of the Medical Branch, foresaw the high incidence of allergy in the Army; and allergy clinics were established in every Army post throughout this command. With this help and the cooperation of the Fourth Service Command Laboratory all cases of allergy are carefully investigated. Whenever feasible, the allergic soldier is treated and kept in the service. The responsibility for treating the thousands of rejectees for asthma falls on civilian physicians. More specific studies and treatment are essential to prevent the later more serious complications.

#### CONCLUSIONS

1. Despite careful induction examinations the incidence of asthma in the Army is high.

2. Psychic factors play an important role in the production of attacks in predisposed individuals.

3. Specific or etiologic treatment is overlooked or ignored by the general practitioner.

4. Prognosis is determined by the complications.

5. Rackemann, F. M.: Asthma: Two Hundred and Thirteen "Cured" Patients Followed Up Four Years Later, *Arch. Int. M.*, 50:819, 1932.

6. Unger, L.: Bronchial Asthma—Results of Treatment in Two Hundred and Seven Patients Under Observation for a Period Varying from One to Thirteen Years, *J. Allergy*, 7:364, 1936.

7. Sussman, M. L., Grishman, A., and Steinberg, M. F.: The Roentgenologic Diagnosis of Right-Sided Enlargement of the Heart, *N. England J. M.*, 288:777-783, 1943.

8. Schiller, I. W., Colmes, A., and Davis, D.: The Occurrence of Cor Pulmonale in Cases of Bronchial Asthma, *N. England J. M.*, 228:113-117, 1943.

9. French, S. W., and Halpin, L. J.: Army Allergy, *Annals of Allergy*, vol. 1, No. 1, pp. 1-17, 1943.

# The Diagnosis of Schistosomiasis

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Human schistosomiasis is caused by one of three varieties of blood flukes, the *Bilharzia*, or *Schistosoma haematobium*, *mansoni*, or *japonicum*. The *japonicum* is primarily a liver fluke. *Mansoni* infests for the most part the large bowel. *Haematobium*, like the other flukes, may be found in any organ or part of the body but is usually associated with the urinary tract and, except in very few instances, is limited to the base of the bladder and the distal third of the ureter.<sup>1</sup>

Bilharz in 1851 recognized the *Schistosoma haematobium* as the etiological agent of endemic hematuria in Egypt. The name *haematobium* emphasizes the most obvious clinical manifestation of the disease, hematuria, a symptom which does not occur until at least two or three months after the original infestation. In Egypt, where the infestation is almost universal, it is commonly known as "Bonah itch," which name emphasizes the initial symptom, itching, and also the fact that it most commonly occurs during the hot month of Bonah (June). The laborers who do the irrigating along the Nile work and bathe at night, as that is the easiest way to avoid becoming infested, because of the fact that the optimum temperature for hatching ova of the *Schistosoma* is between 80° F. and 100° F.

## LIFE HISTORY OF SCHISTOSOMA HAEMATOBIMUM

When urine containing schistosoma ova is passed into water, a fluid of lower osmotic pressure than urine, the shell membrane and chitinous cuticle swell and burst. A mature, recently voided ovum will hatch in about five minutes at a temperature of 90° F. to 100° F., but may require twenty minutes at a temperature of 70° F. to 80° F. The hatching of a batch of eggs may take a day or two, but a very large number hatch in the first few hours. The miracidia so hatched swim about trying to find the intermediate snail host (*Physopsis africana*). At present no host is known in the United States. The life cycle of the miracidium in the snail takes about six weeks. During this time each miracidium develops into thousands of bifid-tailed cercariae and these are attracted by a disturbance in the water and by warmth. Unless able to find a host they die, as a rule, within forty-eight hours. They generally remain close to the snail from which they have been hatched; so the most likely place in which to find them is

1. Afifi, M. A.: Roentgenographic Manifestations of Urinary Bilharziasis and Calculus Formations in Egypt, and Intravenous Pyelography, *Am. J. Roentg.*, 31:208-223, February 1934.



in stagnant or slowly moving water at the edge of a pool or near the bank of a stream, especially near grass or other vegetation. Children are, therefore, more commonly infested than adults, as they wade near the banks of streams rather than out in the middle away from the vegetation.

The cercariae may penetrate any part of the human body with which they come in contact. If one drinks heavily infested water the parasites immediately cling to the tongue and mucous membrane of the mouth through which they gain entrance to the body. They seldom allow themselves to be swallowed; usually, however, they gain access through the skin of the legs, thighs, and body. While the course that cercariae take after penetrating the skin has been studied by many investigators, not until 1924 did Faust and Meleny<sup>2</sup> satisfactorily show the normal course that the parasites take to reach the bladder and the distal portion of the ureter. After penetrating the skin they soon reach a lymphatic or vein which carries them to the heart, from where they go to the lungs, traverse the pulmonary capillaries, return to the heart, and may then be distributed throughout the body. The majority of them traverse the capillaries of the gastrointestinal tract and find their way to the mesenteric and portal veins, where they mature and live in small numbers, coupled or isolated. From here they gradually swim upstream; so they are found in greatest numbers in the venous plexuses in the pelvis—viz., the vesicoprostatic and the uterine and hemorrhoidal plexuses, where the ova mature. Many find their way into the lumen of the terminal ureter or bladder and are once more voided. The worms may live for years in the host, the female continually laying eggs. Cases have been reported in which live mature ova were still being voided eighteen to twenty-eight years after infestation without reinfestation. On account of the mode of dissemination, mature worms may be found in any part of the body, and there are few organs in the body in which ova have not been found. The urinary bladder and the distal third of the ureter are the parts most commonly involved and by far the greatest source of symptoms, so much so that at one time the disease was known in Egypt as Egyptian hematuria, and in South Africa as Cape hematuria.<sup>3</sup>

#### SYMPTOMS

When the cercariae first penetrate the body, they usually cause intense itching, which frequently lasts a varying length of time up to four or five days. At the site of entry of each cercaria there may be a small, reddish-brown, slightly raised papule not more than 0.5 cm. in diameter. Usually, large numbers of cercariae penetrate the skin, causing what appears to be a "rash" composed of multiple lesions as described. The rash has usually

2. Faust, E. C., and Meleny, H. E.: Studies on Schistosomiasis Japonica, Am. J. Hyg., Monographic Series No. 3, p. 3, 1924.

3. Vermooten, Vincent: Bilharzia as Seen by the Urologist, Proc. Transvaal Mine Med. Officers' Assn., 20:11-16, August 1940.

disappeared at the end of twenty-four or forty-eight hours. The discomfort of this original brief period of actual infestation is frequently so minimal that from few patients can one get an actual history of this symptom. On rare occasions, it may be associated with malaise and fever which soon pass off.

Two or three months later the patient notices some terminal hematuria, which alarms the unwary. In endemic areas, however, little attention is paid to this manifestation, for it may clear up after a short period of time. In a large number of cases the hematuria is so transitory that the infested person does not recognize it. This gives a false sense of security with the result that no treatment is sought or received until late complications become manifest after a period of ten or fifteen years. On the other hand, a smaller number of patients continue to have terminal and occasionally total hematuria off and on, or continuously for two or three years or longer.

#### DIAGNOSIS

The best time to find the ova in the urine is while terminal hematuria is present. They can almost always be found in the last 15 or 20 cc. of bloody urine. The ova are ovoid with a terminal spine and are about five times as large as a polymorphonuclear leukocyte. They are readily recognizable in the centrifuged sediment of a sample of urine, but as a rule it is not necessary to centrifuge the urine for the ova are heavier than urine and they will settle in the bottom of a conical glass. After the urine has been allowed to settle for several hours, a drop is collected from the bottom of the glass and viewed as a wet preparation under the low-power lens of a microscope. The ova are thus readily seen and identified. After treatment, the dead ova can be differentiated from live ova. The live ova are clear and transparent; the dead are dark in color, lose their transparency, and appear brown.

An eosinophilia up to 10 or 12 percent or even higher may be encountered during the active stage of the infestation. More commonly it is about 5 or 6 percent. After the disease has been present for five to ten years or even longer, frequently an eosinophilia of 2 or 3 percent may be present.

#### CYSTOSCOPIC APPEARANCE

In early stages of the disease when hematuria first becomes apparent, the cystoscopic appearance is not characteristic and is not of much help. One sees merely an acute diffuse basal cystitis with moderate edema and much diffuse, generalized redness, usually most marked around the ureteral orifices and the base of the bladder but frequently extending over the trigone. As the acute phase passes and ova are being deposited under the mucosa and extruded through the mucosa into the bladder in fewer numbers, only patchy areas are seen, from 1 to 3 cm. in diameter and very slightly raised above the normal surrounding mucosa. When

these are casually looked for through a cystoscope, they are usually overlooked. When one suspects *Schistosoma*, these areas are readily recognized, almost always on one or both ureteral ridges adjacent to the ureteral orifice or completely surrounding and including the orifice. Next one sees them over the base, less frequently on the lateral wall and trigone, and least commonly on the vault or dome of the bladder. When one sees what appears to be a slightly raised, dull, and somewhat avascular area, and then turns the light of the cystoscope so that, instead of shining at right angles to the area, it shines at an angle of 45° or greater, the surface of this area will shimmer like wet sea sand in the moonlight. For this reason, in Egypt, these areas have become known as "sandy patches." The effect is due to the presence of large numbers of ova lying immediately under and in the epithelium of the bladder mucosa. (See figure 1.)

A less common cystoscopic appearance is what seems at first to be groups or collections of "pustules." These are raised rounded nodules, 1 to 2 mm. in diameter, pure white, and without an area of redness at the base. They are caused by conglomerate masses of ova which may be in the process of becoming calcified. I have called these nodules "sago bodies." They may occur singly, but more commonly are grouped in batches of four or five up to eight or ten or more.

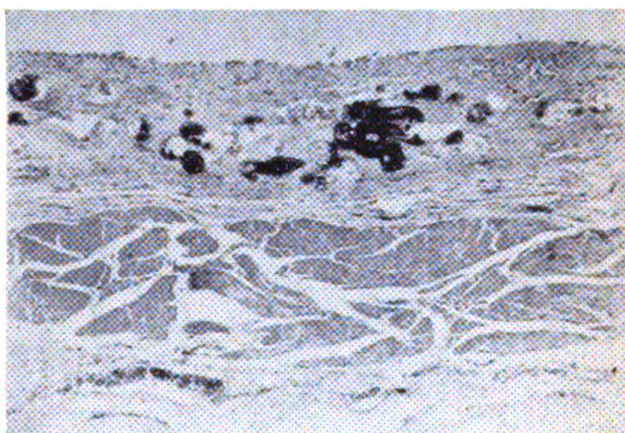


FIGURE 1. Photomicrograph showing conglomerate masses of schistosoma ova immediately underneath the vesical mucosa. This section of tissue was taken through a "sandy patch."

The least common lesion is the "schistosoma papilloma." I have been unable to differentiate cystoscopically between a schistosoma papilloma and an ordinary common benign villous papilloma. Microscopically, these papillomata are laden with ova. The only way I know of making a clinical diagnosis is presumptive. If ova have been found in the urine, or if sandy patches or "sago bodies" can be seen cystoscopically and a papilloma is present, one might be reasonably sure that a section through the papilloma will show that it contains ova. These schistosoma papillomata are relatively uncommon, so that I have never been satisfied that the lesion is due to the disease. It seems more reasonable to assume that the papilloma has become infested with ova. The ova are laid by the worm and are pushed out along the vessels to the surface. Papillomata are well vascularized, and there is



no reason why, if eggs are being deposited in the vessel supplying the papilloma, they will not be deposited in the papilloma. "Carcinomatous degeneration" due to *Schistosoma* is much rarer clinically than the literature would lead one to assume. Again, why should one assume that *Schistosoma* caused the carcinoma rather than that the ova had been deposited in the carcinoma?

The common end result of a heavy infestation is either calcification of the ova or merely fibrosis with resulting apparent avascularity of the bladder mucosa. Fifteen or twenty years after a severe generalized bladder infestation, the bladder may show no cystoscopic evidence of schistosomiasis in the form of sandy patches but will give the appearance of an almost completely avascular structure in which it may be almost impossible to see or find a ureteral orifice. If one is found, it will be pin point in size and may admit only a whalebone filiform with difficulty.

#### RADIOGRAPHIC APPEARANCE

By this time other evidences of long-standing schistosomiasis may have become manifest. Apart from the pathognomonic roentgenographic appearance of the ureters, one may in rare instances see characteristic linear calcifications in the ureters and bladder.<sup>4</sup>

As the mature worms live in the pubic, vesical, and uterine venous plexuses and deposit their eggs there, one would expect that the base of the bladder and the pelvic portions of the ureters will be involved. This must, of necessity, result in narrowing or stricture of the intramural portion of the ure-

ter with enlargement, dilatation, and elongation of the involved, edematous pelvic portion. As dilatation is commonly accompanied

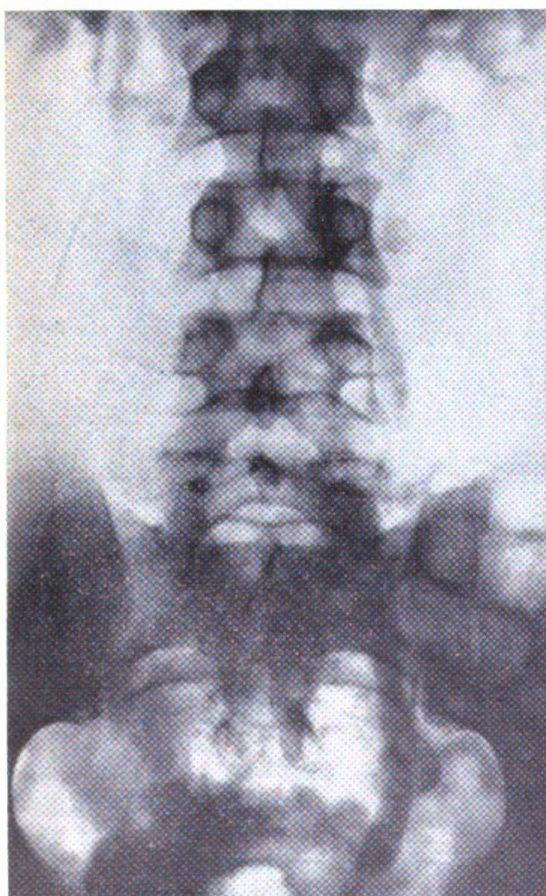


FIGURE 2. X-ray photograph of a patient with schistosomiasis of ten years' standing, showing marked tortuosity of the pelvic portion of the ureters with normal upper urinary tract.

4. Vermooten, Vincent: Bilharziasis of the Ureter and Its Pathognomonic Roentgenographic Appearance, J. Urol., Balt., 38:430-441, November 1937.

by elongation, it is not uncommon to find, in old cases of schistosomiasis, a normal renal pelvis with normal calices and normal upper ureter, but with a dilated, tortuous pelvic ureter. In the occasional instance in which healing is associated with calcification one can, on radiographic examination, see a calcified outline of the bladder as well as parallel calcified lines outlining the ureter (figure 2).

#### SUMMARY

Bilharziasis of the urinary tract, resulting from infestation with *Schistosoma (Bilharzia) haematobium*, manifests itself by hematuria for the first time about two to three months after the initial infestation. Hematuria may be total, but is more commonly terminal.

Ova may be found in urine while hematuria is present and sometimes even later. If urine is allowed to stand in a conical glass, the ova will settle at the bottom and are then readily found. Eosinophilia up to 10 percent is usually present.

Cystoscopically, infestation with *Schistosoma haematobium* is readily recognized in the form of "sandy patches," or conglomerate masses of raised white nodules, 1 to 2 mm. in diameter. On rare occasions benign papillomata of the bladder or even carcinomata may be infiltrated with ova.

Ten to twenty years after a massive or after repeated infestations, the bladder may appear, on cystoscopic examination, as an almost completely avascular organ with pin-point ureteral orifices. The distal one-third or one-half of the ureters may be dilated and tortuous, while less frequently the bladder may be seen outlined as a narrow calcified ring and the distal ureters as parallel lines of calcification.



American field hospital on Mediterranean Sea, west of Cefalù, Sicily. 9 August 1943.



# Air Blast Injury

## Report of Cases

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During the establishment and consolidation of a beach-head in the Southwest Pacific, fifteen patients suffering from the percussive effects of high explosives were admitted to hospital. Five cases are reported in detail. Three of these patients complained of pain in the forehead associated with hyperesthesia limited to the distribution of the supra-orbital nerve, and two of them had exquisite hypersensitiveness of the skin which followed nerve root distribution. Recent literature deals chiefly with lung trauma and to a lesser extent with damage to the central nervous system. There are but few remarks pertaining to symptomatology and pathology referable to the spinal and peripheral nerves.

In addition, comment is made here on three deaths from pulmonary trauma, since the clinical courses and autopsy findings led to some conclusions regarding therapy and the relationship of the patients to the sites of the explosions is of interest.

### Case Reports

CASE 1. An infantryman was admitted one hour after a high-caliber shell had exploded about three yards from him. He was found dazed but not completely unconscious. On initial examination he was lethargic, confused, and disoriented; he complained bitterly of generalized headache. There was no evidence of external injury and no abnormal chest or abdominal findings. Neurologic examination was negative except for the disturbed sensorium. In the succeeding twenty-four hours he became rational and oriented but continued to complain of severe headache. He was evacuated the day after admission.

Six weeks later he returned from a hospital in the rear echelon. Eight weeks after injury, he returned with the complaint that for the past seven weeks his generalized headache seemed to localize in the right forehead. The character of the distress changed to definite, constant pain in this area. The skin of the right forehead and the adjacent portion of the scalp were sensitive to touch. He was not incapacitated, but his efficiency was so reduced that he was not fit for combat duty.

Physical examination was negative and there was no evidence of mental disease. Marked tenderness over the right supra-orbital notch and moderate hyperesthesia limited to the distribution of the supra-orbital nerve were present. Hearing in the right ear was diminished, but the tympanic membrane was not perforated. The cranial nerves were otherwise intact. The optic fundi were normal. X-rays of the skull did not show any abnormality.

Because of the localization of the pain and hyperesthesia, 1 cc. of 1 percent procaine solution was injected into the right supra-orbital nerve

at the supra-orbital notch. The pain and hyperesthesia of the forehead and the adjacent scalp were promptly relieved for twelve hours; both reappeared, but with such lessened severity that the patient asked to be returned to duty. As he was not seen during the succeeding three months, it was assumed that his commanding officer considered him fit for combat.

CASE 2. An infantryman was admitted five weeks after a bomb exploded within fifty feet while he was at mess. He had been stunned but had been able to do light duty during the remainder of the day. Although his head had cleared the morning after injury, he had moderately severe pain localized in the left forehead and the adjacent portion of the scalp. Over the succeeding weeks the pain increased to the point of complete incapacity. Exertion aggravated the pain so much that he was unable to walk to mess. The skin over the left forehead was sensitive, and the disturbance of his hair during a breeze was uncomfortable.

Physical examination was negative and he seemed well adjusted. Neurologic examination showed marked tenderness over the left supra-orbital notch, and the pain was reproduced by pressure in this area. Marked hyperesthesia limited to the distribution of the supra-orbital nerve was present.

On the first, second, and fourth hospital day, 1 cc. of a 1 percent procaine solution was injected into the left supra-orbital nerve at the supra-orbital notch. After the first two injections the pain and hyperesthesia were promptly relieved but recurred with lesser severity in about twelve hours. Following the third injection, the pain was relieved for at least forty-eight hours. As it was necessary to evacuate him at this time, he could not be followed subsequently.

CASE 3. An antiaircraft artilleryman was injured the day of admission. He was standing a few feet from an antiaircraft rifle which exploded accidentally. He thought he might have been unconscious for about ten minutes. After recovery he complained bitterly of pain in both sides of the forehead.

No abnormal findings appeared on examination of the chest and abdomen. Diminished hearing was present in the right ear and the right tympanic membrane was perforated. His headache was treated for several days with codeine and aspirin without relief. Neurosurgical consultation was requested. Marked tenderness was found over both supra-orbital notches and pressure at these points aggravated the pain. Except for slight hyperesthesia to pinprick of the skin of the forehead and adjacent portion of the scalp, neurologic examination was negative. The optic fundi were normal. X-rays of the skull did not demonstrate any abnormality.

One cc. of 1 percent solution of procaine was injected into each supra-orbital nerve at the supra-orbital notches. Relief of pain was prompt and complete for eight hours, but there was a recurrence of equal severity. Unfortunately, it was necessary to evacuate him the day of admission.

The pain and hyperesthesia in these patients was presumably due to a traumatic peripheral neuritis of the supra-orbital nerve. The onset in each instance dated from the time of injury, and the symptoms persisted for seven weeks, five weeks, and one week, respectively. The pain was constant, never lancinating, and was the sole disabling sequela in the first two patients and probably in the third. Each of the patients was emotionally stable. Conservative treatment consisting of rest, sedation, and reassurance had failed.

Injection of the supra-orbital nerve with procaine produced complete although transient relief. While the effects of the injection lasted, the patients felt perfectly well. In the future when patients with such pain present themselves, we propose to give them a trial injection of procaine, and if this gives complete relief, to follow it with an injection of alcohol. Had this been done in the cases reported, all might have been returned to duty within a few days.

Of the second group of two patients with exquisite hypersensitiveness of the skin of root distribution, in one the hyperesthesia was present in all dermatomes, from head to foot; in the other, it was limited to the skin of the left lower extremity distributed over the second, third, and fourth lumbar dermatomes.

CASE 4. A lieutenant and two fellow officers were in a foxhole during an air raid when an antipersonnel bomb exploded five feet away.

The lieutenant was conscious but somewhat confused. He complained of extreme sensitivity of the skin over the entire body, with exception of the face and forehead, and most marked over the thorax and upper extremities. He lay motionless, and the slightest jarring of his litter caused him to scream with pain. He could not tolerate the pressure of a sheet. No evidence of external injury was found. There were a few moist rales at the bases of both lungs, but no dyspnea or cyanosis. The generalized hyperesthesia persisted with the same severity for three days. Morphine was required for relief. The sensitivity decreased gradually but was still present in moderate severity at the time of his evacuation on the tenth hospital day. During the first twenty-four hours the patient had several small hemoptyses and numerous rales in both lungs were present; the latter disappeared by the fifth day.

CASE 5. A corporal was injured by the blast of a bomb which exploded seven feet from a foxhole in which he was lying. Even gentle manipulation of the left lower extremity caused the patient to cry out with pain. He could not tolerate the weight of a sheet on his leg. A detailed neurologic examination could not be done because of his desperate condition, but the hyperesthesia was most intense in the left second, third, and fourth dermatomes.

A definite explanation of the neurologic symptoms and findings in these five patients cannot be offered. Zuckerman has reported hemorrhages into the spinal nerve roots in animals exposed to the blast of high explosives in air. Such hemorrhage may have occurred in the latter two patients. Unfortunately, the nerve roots were not examined at the autopsy of the corporal. In the cases with supra-orbital pain and hyperesthesia, it is possible that the nerve was contused at its exit from the supra-orbital canal.

Of the three peripheral neuritides in this series, all were confined to the supra-orbital nerves. In a larger group of patients, involvement of other peripheral nerves may be found.

As the observation of three patients who died of pulmonary damage led to certain conclusions regarding treatment, the history, course, and autopsies follow.

CASE 6. A captain, during an air attack, sought cover in a narrow foxhole 2 feet deep. An antipersonnel bomb exploded fifteen feet away, injuring him and killing two fellow officers outright. The deceased officers were lying in a second foxhole, one on the other, eight feet from the perimeter of the bomb crater. The one uppermost was at ground level. No evidence of external injury was found.

The patient was brought to the hospital immediately, and when examined twenty minutes after injury he was semicomatose. No external injury was found. He was dyspneic and there were moist rales throughout both lungs. The blood pressure was 80/60 mm. of mercury.

Shortly after admission he became unconscious, and thereafter could not be aroused. The lungs filled rapidly with fluid, dyspnea increased, and cyanosis appeared. He was constantly in shock. Intranasal oxygen was given from the beginning. One unit of plasma was administered slowly. Death occurred twenty hours after injury.

CASE 7. Three lieutenants took cover in a foxhole 5 by 7 feet by 3 feet deep, surrounded by one layer of sandbags. An antipersonnel bomb exploded five feet away. The two officers nearest the explosion received moderately severe lung injury from which they recovered. However, the officer on the far side died within ten minutes while being transported to the hospital.

Postmortem examination revealed superficial lacerations about the body, but no other external injuries. The mouth was filled with a pink, frothy fluid. Except for scattered subpial hemorrhages over both cerebral hemispheres, the external appearance of the brain was normal. Serial cut sections of the hemispheres, cerebellum, and brain stem showed no visible hemorrhages. No abnormal fluid was present in either pleural cavity. The right lung was more severely injured than the left. The external surface of the right upper and middle lobes was dark red. Their consistency was that of liver. There was very little crepitus. The right lower lobe and the left lung contained patchy areas of subpleural hemorrhage. Cut sections of the right lung were of a dark red, meaty appearance. A large amount of bloody fluid exuded. Sections of the left lung were less moist, and more crepitus was present. A few petechial hemorrhages were found over the surface of the left ventricle. About 250 cc. of blood were present in the pelvis, having descended from a minor laceration of the spleen.\*

All sections of the right lung showed the alveolar spaces packed with erythrocytes. In many areas the alveolar walls were ruptured. The alveoli of the left lung contained fewer erythrocytes and were filled with a pink-staining fluid. Sections of the liver, kidneys, and spleen showed no abnormality. No brain sections were submitted.

CASE 8. A corporal took shelter in a foxhole 2 feet deep during an air attack. An antipersonnel bomb exploded eight feet away. He was admitted to hospital within fifteen minutes after injury with multiple superficial abrasions from flying coral but no other external injuries. He was very dyspneic and slightly cyanotic. Numerous moist rales were present throughout both sides of the chest. His lungs filled with fluid, and dyspnea and cyanosis were progressive. About eight hours after admission he became unconscious. The blood pressure remained at shock level until death, twenty-three hours after injury. Intranasal oxygen was given from the beginning. Two units of plasma were administered over a period of several hours without benefit.

At postmortem examination, the cerebral cortex appeared edematous. A small hemorrhage came from a branch of the posterior cerebral artery.

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\*The ruptured spleen was probably due to the blast, inasmuch as there was no evidence of external injury to the left chest or to the abdomen.

Cut sections of the brain showed nothing significant. The left pleural cavity contained about 500 cc. of dark red fluid, the right about 200 cc. Large subpleural hemorrhages were over the surfaces of both lungs, more marked on the left. Scarcely any crepitus was present in either lung. Sections of both lungs appeared friable. A small subserous hemorrhage was present in the antimesenteric border of the sigmoid colon.

Microscopically, there were focal areas of recent hemorrhage in the cerebral cortex. Other brain sections were not submitted. The alveoli in all the lung sections were packed with erythrocytes. The walls of the bronchioles were edematous, and many were ruptured. Focal areas of recent hemorrhage were present in the splenic pulp. Liver and kidney sections were normal.

Since three of these patients who died from severe lung trauma survived for nearly twenty-four hours, conclusions may be drawn regarding the treatment of critical pulmonary injury. First, strict bed rest and the limitation of even passive motion are necessary. Clark and Ward state that often some of their experimental animals exposed to impact waves in water appeared almost normal immediately after injury, later to succumb when sufficient hemorrhage had occurred in the lungs. They also observed a sudden change for the worse in animals which struggled after a period of quiet.

Second, plasma is rarely indicated for the accompanying shock. The postmortem examination in the case of the lieutenant who died ten minutes after injury demonstrates the severity of the original damage to the pulmonary epithelium and the rapidity of the loss of circulating fluid into the lungs. While shock secondary to this fluid loss may be severe, any increase in the intravascular hydrostatic pressure resulting from the introduction of plasma augments the outpour of fluid and thus hastens death. These patients die primarily of the asphyxia of drowning.

Third, the chief problem in treatment is to tide the patient over the acute transudative phase of the injury by preventing the loss of circulating fluid into the lungs. This might be accomplished by exhalation against positive pressure as provided by a type of intermittent flow mask like that designed by Barach. Some brilliant recoveries from acute pulmonary edema have been reported by him with the use of this mask. It is possible that such pressure on exhalation might stem the transudation of fluid into the alveoli in blast injury, thus preventing the anoxia resulting from the loss of absorptive surface and, at the same time, the shock secondary to the diminution of volume of circulating fluid.

Measurement of the depth of foxholes and their distance from the bomb craters in these cases suggested that a hole rendering the maximum protection from blast should be about 4 feet deep. In several additional instances observed, men in shallow foxholes were killed outright, while others in the same radius, protected by holes 4 to 5 feet deep, escaped injury. A hole much deeper than this, on the other hand, makes more likely the risk of suffocation from collapse.



# Contact Poison Plants in the Old World Tropics

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Many physicians perhaps do not realize that certain trees and some shrubs in the Old World tropics, all belonging in the same natural family of plants as our poison oak and poison ivy (*Rhus*), the Anacardiaceae, are violent contact poisons. Contact with the fresh sap, in some cases with fresh leaves, or in certain species with freshly sawed lumber may cause violent dermatitis corresponding exactly to that caused by *Rhus* at home. It seems apparent that the poisonous principle is the same in all of these representatives of the Anacardiaceae, a nonvolatile, very irritating oil that may retain its activity over long periods of time.

The genus *Rhus* is of world-wide distribution and contains about 200 described species; yet, as the genus is at present constituted, only a very few of the species are actually poisonous, and these are confined to North America, eastern Asia, and Japan. In the Indo-Malaysian region some of the species in certain other anacardiaceous genera are poisonous. These include *Gluta*, 15 species; *Swintonia*, 16 species; *Melanorrhoea*, 18 species; *Melanochyla*, 13 species; *Semecarpus*, 90 species; and *Mangifera*, 60 species. All of these are trees, with the exception of some shrubs in *Semecarpus*. To this list should also be added the American *Anacardium occidentale*, the common cashew tree, which is now widely naturalized in the Old World, for the pericarp of its fruit carries this same irritating principle that is so characteristic of certain other representatives of the Anacardiaceae.

From personal experience, I judge that by no means all of the *Semecarpus* species and those of the other genera are poisonous, and yet it should be kept in mind that individuals peculiarly sensitive to *Rhus* poisoning may be allergic to any of them. Most of the species of *Mangifera* are innocuous, although some of the Malayan species are very poisonous, in spite of which some of these few are at least semicultivated for their edible fruits. Those known to be poisonous include the "binjai" or "uani" (*Mangifera caesia*), the "lanjut" (*Mangifera lagenifera*), the "bachang" (*Mangifera foetida*), and the "kwini" (*Mangifera odorata*); of these the "lanjut" and the "binjai" are the most poisonous. As certain individuals develop a characteristic skin eruption known as mango rash, after eating the fruits of the common

mango (*Mangifera indica*), it is suspected that the poisonous principle may be present in very small quantities in this, one of the very best of the tropical fruits. One authority advises always treating with respect any mangolike tree which may smell of turpentine. In all or most of these anacardiaceous species the sap, sometimes slightly milky, quickly turns black on exposure to the air; it is this sap that carries the poisonous principle.

In some of the genera—such as *Swintonia*, *Melanorrhoea*, *Melanochyla*, and *Gluta*—the geographic ranges are restricted to southern Asia and parts of the Malay Archipelago proper, especially the Sunda Isles; but *Mangifera* extends to the southwest Pacific region, native species occurring in New Guinea (no information is available as to whether or not these are poisonous), and *Semecarpus*, as far as New Guinea and New Hebrides and far to the eastward to the Caroline Islands and Fiji. All native species of *Semecarpus* and some native species of *Mangifera* fall into the suspect class.

Poisonous trees of this family are not confined to the Old World tropics, for in tropical America some or all of the species of *Metopium*, 2 species, *Comocladia*, 35 species, *Lithraea*, 6 species, and *Pseudomonium*, 4 species, are contact poisons.

It is well known that the lumber of *Gluta benghas*, actually exported at times from Malaya to Europe and the United States, may cause severe dermatitis among millmen and carpenters who work with it. Curiously, most of the poisonous species in Malaya, regardless of the genus to which they may belong, are widely known as “réngas,” the native name in this case indicating the poisonous qualities of very dissimilar plants; in the Philippines this name appears as “ligas,” there applied to the various species of *Semecarpus* only. Everywhere from India to New Guinea and Micronesia, the native peoples know of the deleterious properties of the various species of *Semecarpus* and other genera mentioned, and either avoid them or take proper precautions when handling them. In New Guinea and the Solomon Islands, freshly sawed lumber of *Semecarpus* is known to be a contact poison.

Curiously, in most of these Old World genera, where some or all of the species are definite contact poisons, the mature fruits of many species may be eaten with entire safety, sometimes raw, as in *Semecarpus* and *Mangifera*, or the seeds of certain other species when cooked, as in *Gluta* and in *Anacardium*. Again, representatives of a very considerable number of other genera of the Anacardiaceae are actually cultivated for their edible fruits, including *Spondias*, *Dracontomelum*, *Pleiogynium*, *Odina*, *Pistacia*, *Cyrtocarpa*, *Lannea*, and *Harpephyllum*; none of the representatives of these genera are known to be poisonous.

To be warned that severe or mild cases of dermatitis simulating *Rhus* dermatitis may be expected almost anywhere in the

Indo-Malaysian, Micronesian, and western Polynesian regions is to be forearmed. In general, the same treatments should be applied as in cases of *Rhus* dermatitis at home. Admittedly, some of these treatments may sometimes fail. The irritating principle being a nonvolatile, very irritating oil, naturally any use of salves, ointments, petrolatum, etc., should be avoided, as such treatments merely tend to spread the irritating principle. Thorough washing or even scrubbing with a warm, strong, alkali-soap solution is always indicated, but this treatment should be applied as soon as possible after the individual is exposed; such washing must be very thorough. Bathing in alcohol is also of value, for the irritating oil is soluble in alcohol; but here again the treatment must be very thorough, for if the oil be not entirely dissolved and removed it is spread to uninfected areas to cause additional trouble.

Many treatments for *Rhus* poisoning have been used, and in the United States various lotions are available in the drug stores. It is evident that if the poisonous oil has been on the skin long enough to penetrate the outer layers, then not much can be done about it except to apply palliatives in order to make the patient more comfortable. A 1 percent solution of potassium permanganate has been used, while probably the most commonly utilized is phenolated lotion of calamine, N.F. One well-informed individual claims that one of the most efficacious treatments is to bathe the affected parts with ordinary photographic hypo (saturated solution of sodium hyposulfite).

In this note the account is limited to contact poisons in the sense that certain of our native species of *Rhus* are contact poisons, the available evidence being that the poisonous principle in all of the representatives of the various genera discussed above is the same as that in *Rhus*. Some individuals are highly immune; others are very allergic to the poisonous principle present in these plants. No consideration is given to those plants armed with stinging hairs such as those of the cowage (*Mucuna*), as such hairs are largely mechanical in effect. However, the tree nettles (*Laportea*), of which there are many species, all shrubs or small trees, extending from India to Australia, should be noted. Here the stinging hairs are charged with a very irritating liquid which contains formic acid. The slightest contact gives the sensation of having touched very hot iron, the response being immediate. Much pain and extensive water blisters follow. Admittedly, not even a cub Boy Scout would knowingly touch one of these plants a second time; nevertheless, bad cases due to accidental contacts with *Laportea* may be expected. The indicated treatment here is to bathe the affected parts with almost any alkaline solution, as this tends to neutralize the very irritating formic acid.

## SERIAL "SPOT" FILM DEVICE

CAPTAIN ROBERT S. HAYDEN

Medical Corps, Army of the United States

Experience in operation in the field of the X-ray Department of the 27th Station Hospital and observation of the difficulties encountered by other roentgenologists in this sector in the performance of x-ray examination of the gastro-intestinal tract using standard Army field equipment have clearly demonstrated the need for a simple serialographic "spot" film device adapted to this equipment and capable within its limitations of producing satisfactory roentgenograms. I have made such a device which has amply proved its value by permitting prompt recording of images seen fluoroscopically. One of the common difficulties of making gastro-intestinal x-ray examinations without "spot" film devices is the recording of images seen with the fluoroscope for a permanent record and for objective demonstration to other physicians.

This device also saves film, as four views may be recorded on a single 10" x 12" film, and it improves radiographic quality through use of lead diaphragm and small aperture.

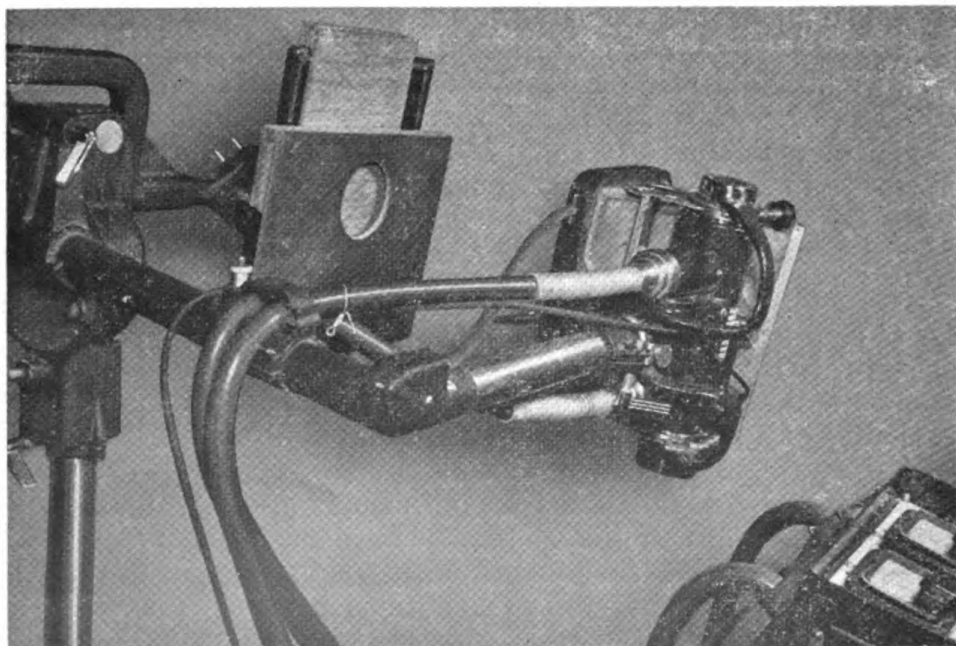


FIGURE 1. "Spot" film device in position for use.

It is extremely simple in construction. Materials required are plywood, sheet lead, and nails. If screws are available, so much the better. The diagrams and photographs are, I believe, self-explanatory. Measurements should be made accurately. Those given are based upon the standard 10" x 12" cassette. If one chooses, he may make the back panel and its vertical supporting extension from a single piece of plywood. At the

time mine was constructed, it was necessary to employ scrap, as is obvious from the photographs. Tools used were hammer, chisel, jackknife, saw, and wood rasp.

In using this device, it is my habit to arrange the x-ray apparatus for vertical fluoroscopy so that the fluoroscopic screen support arm is at my right, the open end at my left. Behind the shielded tube is the control stand (see photograph). The technician, having given the patient his first glass of barium, takes his place at the control stand. The radiologist, seated, has beside him the spot film device and in his lap behind the protective lead rubber apron a loaded 10" x 12" cassette. Fluoroscopy is begun. Whenever during the course of the fluoroscopic examination he wishes to record an image, the spot film device is placed in position between the patient and the screen and the patient properly centered to the opening. Fluoroscopy is continued until the desired image reappears. It is then possible for the radiologist to slip the film into position and for the technician to perform a manual "quick switch" of the controls in a very few seconds. Practice and teamwork are all that are required. One to four exposures may then be made, rapidly or slowly or even with intermittent fluoroscopy, if desired. This last presupposes the return of film behind the protective apron and remembering the position of cassette relative to the holder.

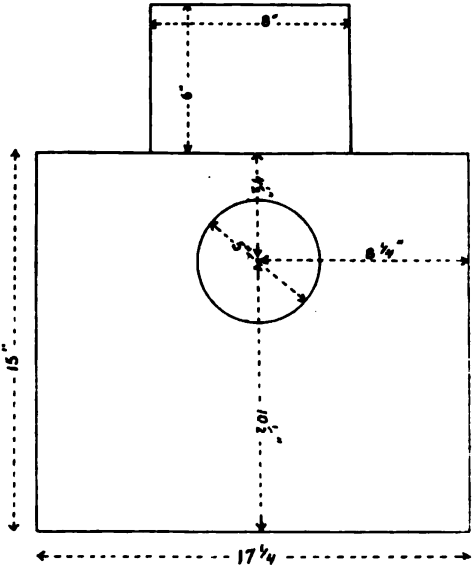


FIGURE 2. Front view of front panel.

For the first exposure the cassette is pushed into the cassette tunnel until its edge is flush with the edge of the tunnel. For the second exposure it is pushed inward until it strikes the end bar which automatically centers

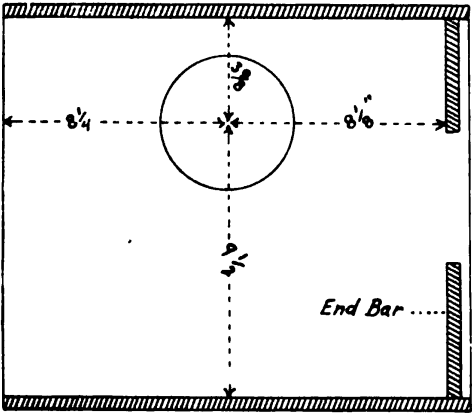


FIGURE 3. Rear view of front panel.

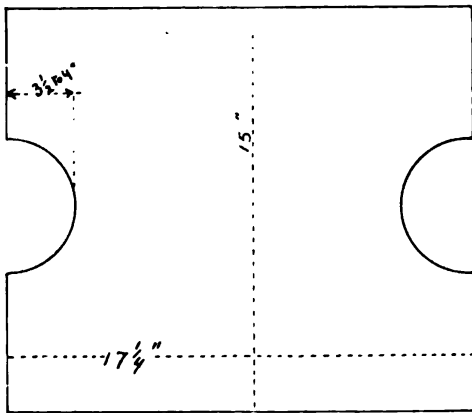


FIGURE 4. Rear panel.



the second quadrant. The upper half of the film has now been exposed. It becomes necessary to eject the cassette from the tunnel, turn it over, and reinsert exactly as for the first and second exposures.

This apparatus serves with the barium enema as well as with the barium meal, the essential procedures being identical. Only the position is changed.

Technical factors will vary according to the capacity and stability of the power source. Using the Army gasoline-electrical generator No. 9606000, one second at 20 Ma. at 80 Kv.P. has been satisfactory for the average soldier. Shorter exposures are to be desired but with them films are likely to be underexposed. At one second involuntary motion will occasionally prove troublesome but by and large results will be of diagnostic quality. If a power source capable of giving 30 Ma. at 85 Kv.P. were available, exposures of  $\frac{1}{2}$  to  $\frac{3}{8}$  seconds would be practicable.

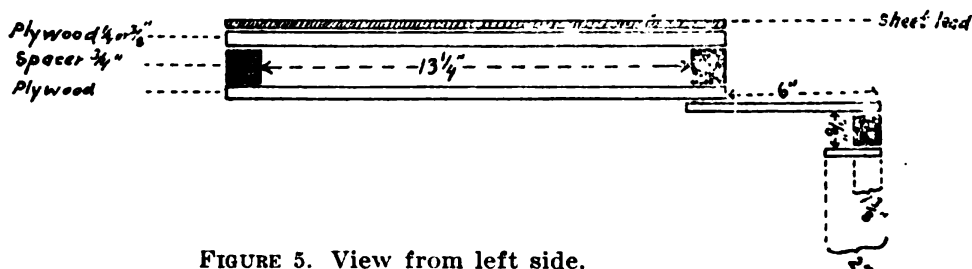


FIGURE 5. View from left side.

#### Summary

This adjunct to the armamentarium of the Army roentgenologist in the field is simple in design and construction and requires only practice and teamwork for its successful employment. It will effect a saving of film. Technical factors are within the range of standard Army field generator and equipment.

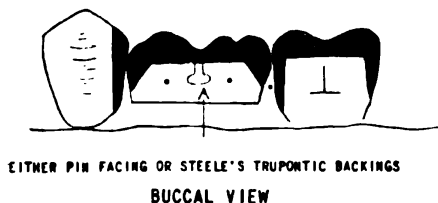
### BROKEN FACING REPAIR TECHNIQUE

CAPTAIN FRANK EPSTEIN

Dental Corps, Army of the United States

Many of us have been confronted with the breakage of porcelain pontics, be they pin facings with baked tips or Steele's tru-pontics. The re-grinding of a new porcelain tooth is a difficult problem and usually a long, tedious process. The result is not always an accurately fitting facing. Since the advent of acrylics, this type of repair has been greatly facilitated.

The technique follows: (1) A piece of base-plate wax is cut and placed on the lingual surface to prevent the impression material from running through. (2) A piece of pliable metal is cut and adapted to the buccal surface, including the teeth on either side of the broken facing. Holes are made to help retain the material. (3) If it happens to be a pin facing, two wires are placed



in the holes with a hook on the end for retention purposes. (4) The alginate materials are preferred; take an impression in the previously made tray of the space. (5) Pick proper shade. (6) Run a model in the stone recommended for processing acrylics. (7) Process the facing in acrylic and cement to place. A wax impression may be made and an acrylic tube tooth processed for the repair of a tooth broken in a partial denture.

## STOOL FOR LEG WHIRLPOOL BATHS

FIRST LIEUT. DOROTHY M. EAGON

Medical Department Therapist, Army of the United States  
and

CAPTAIN HERMAN L. RUDOLPH

Medical Corps, Army of the United States

The use of a leg whirlpool bath presents the hazard of injury because of having to climb into the tub and because of the elevated position of the patient during therapy. The many types of stools and platforms in use make it apparent that an ideal type of stool has not yet been devised. The use of a board at the end of the tub was tried at this hospital, but it was found uncomfortable, hazardous, and generally unsatisfactory. An ordinary high stool also is hazardous.

The stool described here can be constructed of scrap lumber. The support just beneath the inner arc of the top platform is recessed to fit the rolled top

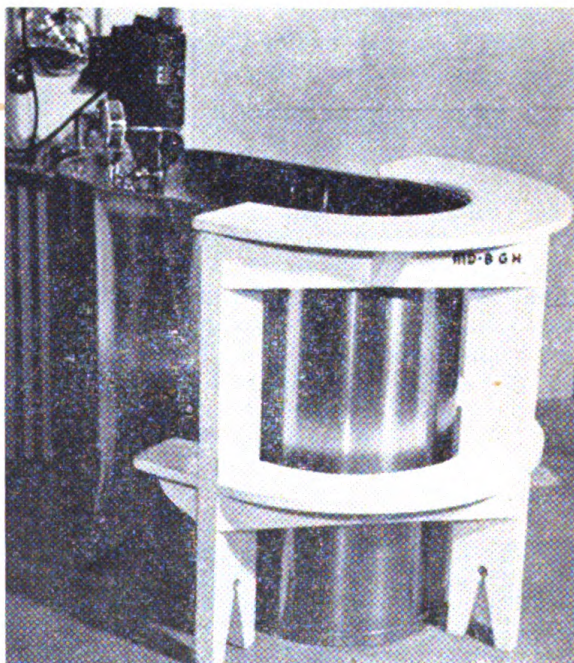


FIGURE 1. Stool in position.

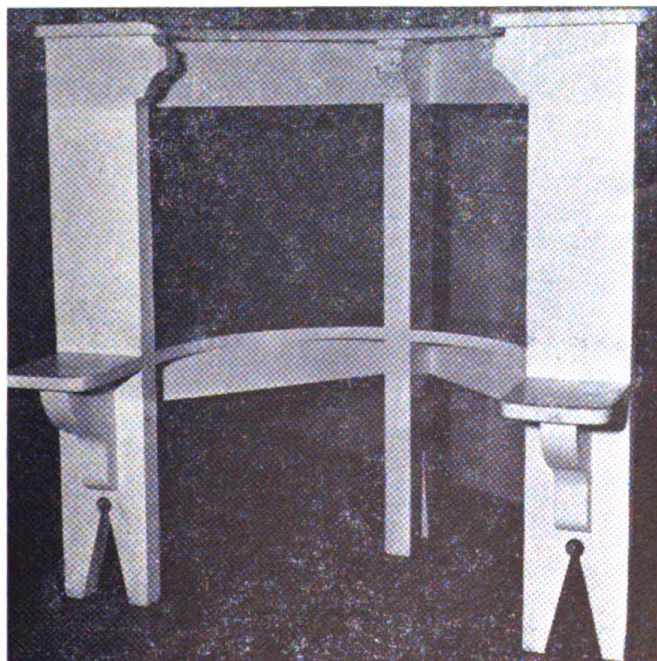


FIGURE 2. Inside view of stool.

edge of the tub. When fitted exactly, it is impossible to tilt this stool, because it is immovable unless it is first pulled away from the tub. The edge of the inner arc of the top platform is rounded and fits over the edge of the tub; this presents the utmost in comfort and makes it impossible to pinch clothing or skin between stool and tub. This stool also permits full use of the bath.

The lower platform simplifies the hazardous procedure of climbing into the tub and is also used

as a support for the opposite leg and as a shelf for towels.

The demands of a heavy schedule have occasionally necessitated the use of the same bath by two patients. This stool permits of this doubling. Ordinarily the use of the same bath by two patients should be condemned.

In constructing this stool, the inner arc of the top platform should be recessed to fit the top rolled edge of the tub; the bottoms of the legs may require adjusting to conform to the grade of a concrete or tile floor. The stool must be constructed to encircle completely the end of the tub and must extend several inches along the sides of the tub. Measurements will vary with the type and construction of the various whirlpool baths.

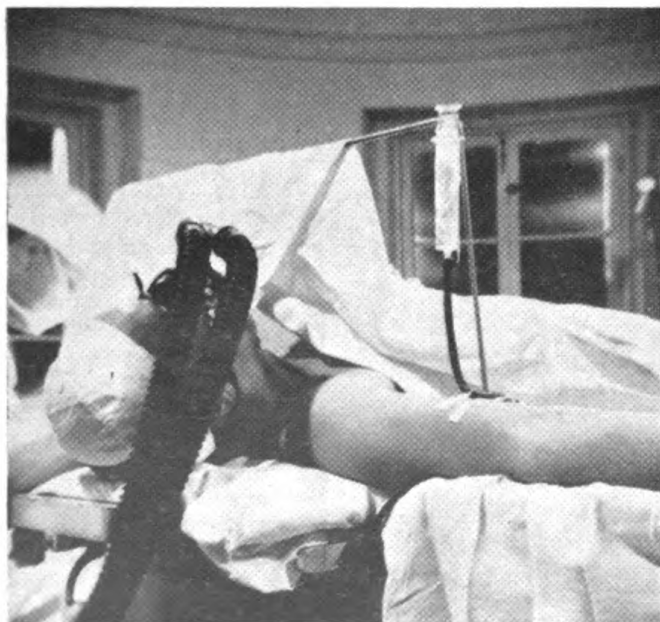
### SIMPLE NITROUS-OXIDE-PENTOTHAL ANESTHESIA

CAPTAIN W. ALLEN CONROY

Medical Corps, Army of the United States

The need for potent, safe anesthesia without explosion hazard has resulted in the independent development of the nitrous-oxide-pentothal combination to its present useful status by many civilian and military anesthetists. The danger of anoxia with the gas has been removed, for 80 percent nitrous oxide (or less) will be adequate when good basal narcosis is maintained with pentothal. Nitrous oxide provides analgesia and some reflex obtundity; pentothal provides relaxation and basal anesthesia.

To obtain simplicity, without sacrificing safety, the intravenous apparatus should be at the head end of the table, where the anesthetist properly belongs. The illustration shows how this is readily obtained. An 8-inch length of intravenous tubing is slipped over a 30-cc. syringe adapter, with



an intravenous glass adapter at the other end for the venipuncture needle. The needle is inserted retrograde in the vein, to decrease the length of tubing required. The glass adapter is taped firmly to the arm. To prevent backflow of blood between intermittent injections and to leave the anesthetist's right hand free, the syringe is suspended from the top of the ether screen by a single 1-inch strip of adhesive, split two-thirds its length, with the two loose ends wrapped criss-cross around the syringe barrel. A further

advantage of the flexible tubing is that it allows for small movements of the arm and for the changing of syringes without dislodging the needle.

Where this combination of agents is to be used for operations about the head, the nitrous oxide may be insufflated by a catheter inserted to the lower end of a common pharyngeal airway. The pentothal syringe occupies the same place, but with the ether screen across the patient's chest. The anesthetist sits close by.